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# Electrical World

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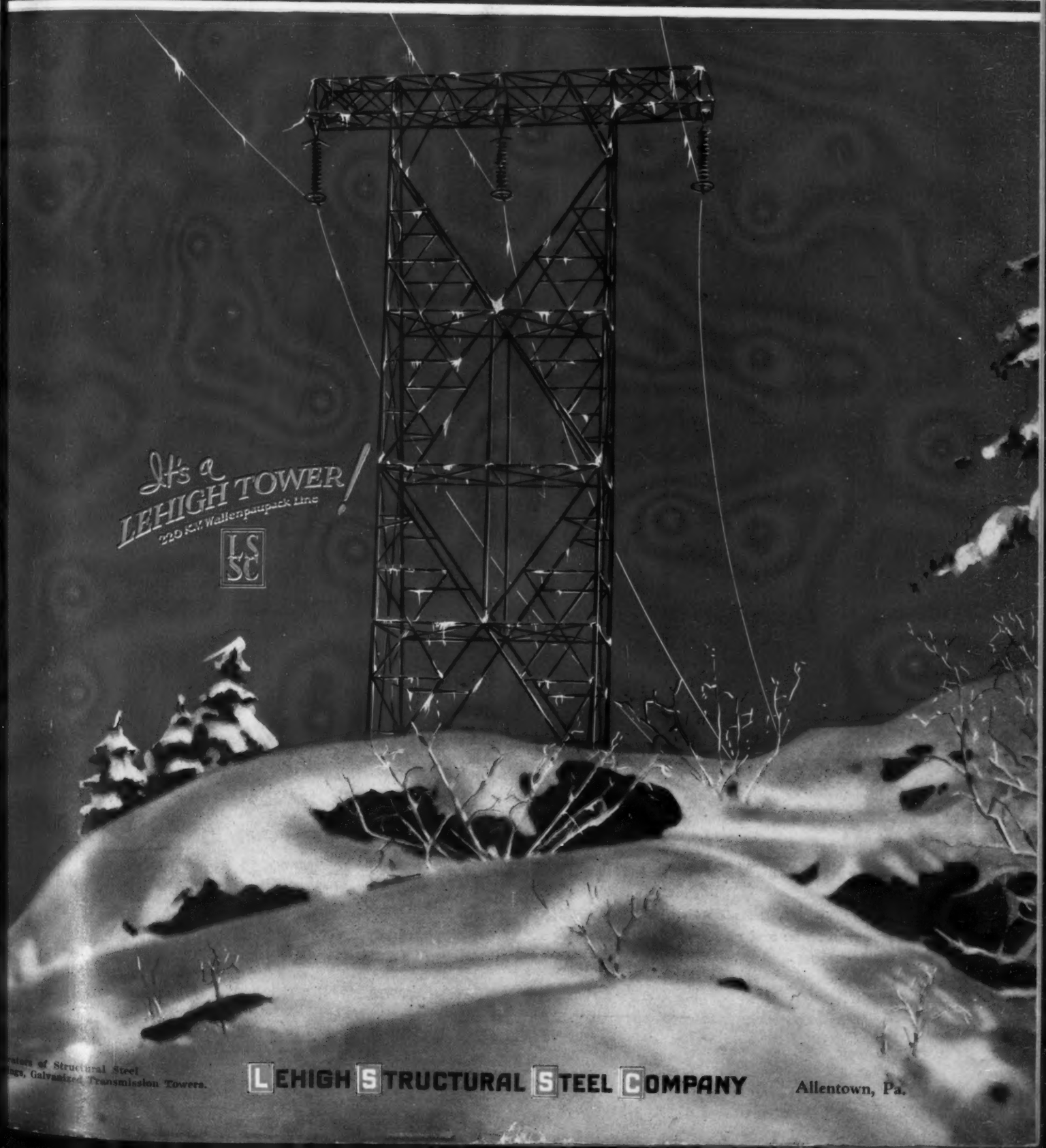

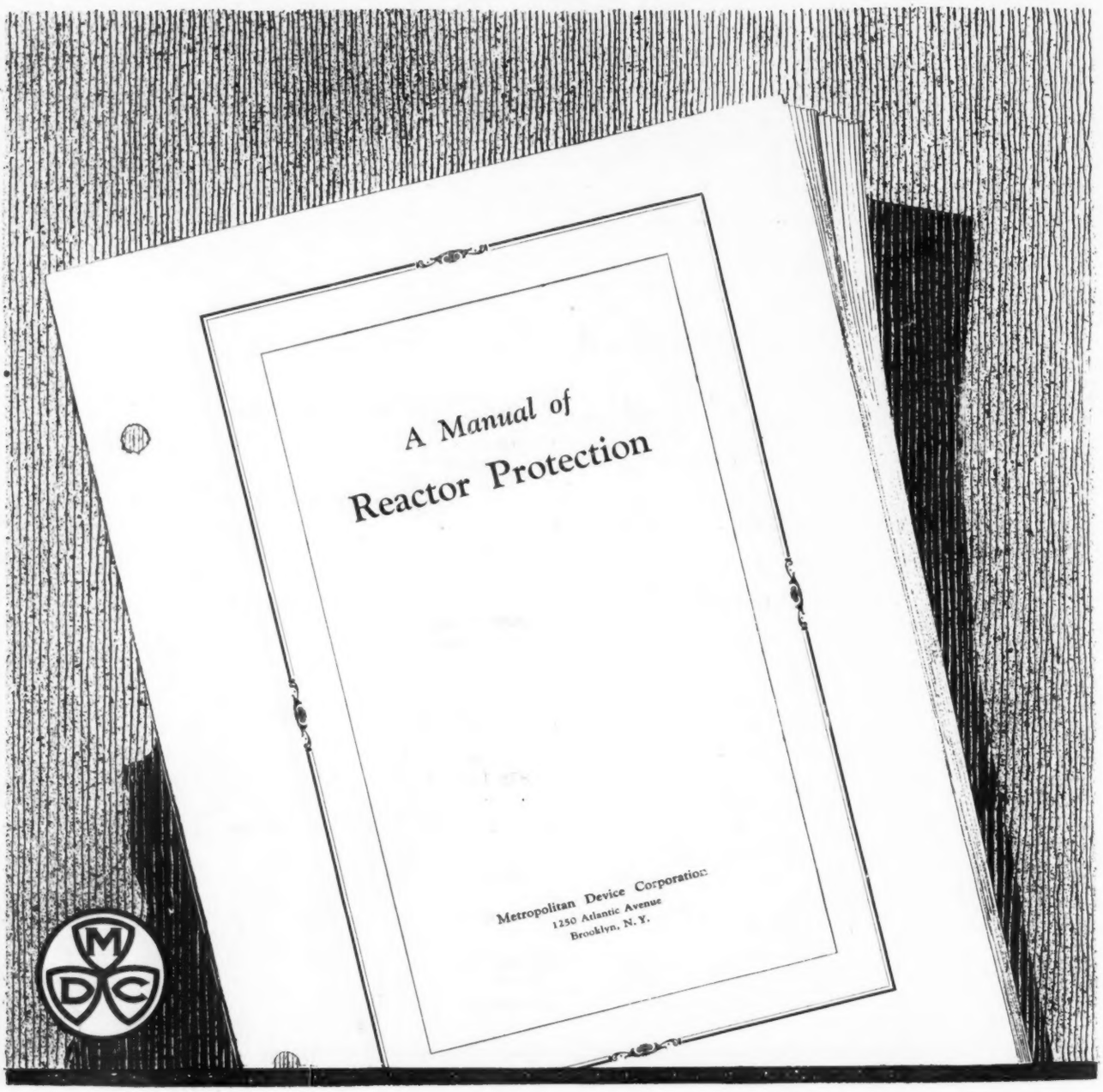


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Vol. 89, No. 4 New York, January 22, 1927 Pages 185-234

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# Electrical World

*The Consolidation of Electrical World, Electrical Engineer and American Electrician*

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McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., NEW YORK, N. Y.

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Cable Address "Machinist, N. Y."

Publishers of
Engineering News-Record — American Machinist
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Electrical West
*(Published in San Francisco)*
American Machinist—European Edition
*(Published in London)*

Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.
Circulation of this issue, 19,875

The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Haiti and Paraguay. Extra foreign postage, $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.
Change of Address—When change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1927, by McGraw-Hill Publishing Company, Inc.

Published weekly

Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.

Advertising Index—Alphabetical, 64; Classified, 88, 90, 92; Directory of Engineers, 30, 31; Searchlight Section, 32-37

# HORIZONTAL BREAK SWITCHES

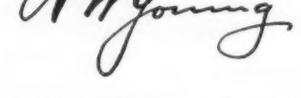
THE largest outdoor substations installed during 1926 were among the great number equipped with horizontal break switches.

During the year 1927 a still greater percentage of the substations to be installed will be equipped with horizontal break switches.

This is a safe prediction because—after experimenting with various types, engineers have awakened to the fact that the horizontal break switch has been thoroughly modernized and equipped with auxiliary mechanism making its operation easier and surer than any other type—especially under ice conditions.

Once assured of this fact, engineers were quick to take advantage of it, for no one will deny that the old reliable horizontal principle is inherently simple and desirable, requires the fewest parts, and therefore the least maintenance.

We have them for all voltages and capacities (7.5 to 220 k.v.). Before deciding on switches for your 1927 requirements is will pay you to investigate our modern horizontal break switches—the "PM-36" and the "PM Form-2".



H. W. YOUNG, *President*, Delta-Star Electric Co.
CHICAGO

# Electrical World

*Published by McGraw-Hill Publishing Company, Inc.*
W. H. ONKEN, JR.
*Editor*

VOLUME 89 — *New York, Saturday, January 22, 1927* — NUMBER 4


## Shall the Government Engage in the Power Business?

OBVIOUSLY the answer to this question is "no," and there would be instant and positive reaction against any such plan on the part of the government if the issue were so clear-cut. But who has not heard of wolves in sheep's clothing? The Swing-Johnson bill, known also as the Boulder Canyon reclamation project, is nothing more or less than a gigantic power project masquerading in the guise of a reclamation and flood-control measure. It proposes to place the government in the power business on the Colorado River and to grant special privileges to California at the expense of the other states along the Colorado River basin. Moreover, it would aid the farmers of southern California to the disadvantage of farmers elsewhere. This is a reversal of American public policy, a violation of American tradition and contrary to the spirit of American law.

Means for safeguarding the public and for conserving the natural resources of the nation have already been provided by the federal water-power act. Just because power will be a by-product it is proposed as an alternative in the Swing-Johnson bill that the Reclamation Service may construct and operate the power plant instead of allocating the power privileges as provided by existing law. This is an imposition on the states themselves and a gross injustice to power companies operating under the federal law. The federal water-power act was enacted after years of hard labor and debate and represents the best thought of financier, operator and legislator. The proof of its merit lies in the record of development which has taken place since its enactment. It is too good a law and safeguards public interest too well to be thus lightly and surreptitiously cast aside. The electrical industry, together with all public-spirited citizens and exponents of conservation, must protest against any weakening of the law and thus foil the attempt of the government to engage in business in competition with an industry already governmentally regulated.

## Interest in Customer Ownership Must Be Maintained

BECAUSE it is easier and oftentimes cheaper to sell junior securities *en bloc* to bankers, executives of electric public utility companies do not show the keen interest in customer ownership that they did when the movement was started. This is lamentable, for the customer owner is one of the great safeguards of the industry—not because, as has been stated by many well-meaning but misguided publicists, customer ownership is a panacea for public ill will or an opiate to sooth irascible public service commissioners, but because it makes partners of people in the community, thereby making good service doubly sure, and, most important of all, helps to keep control out of the hands of bankers.

The electric light and power industry is one of the marvels of the age. Its tremendous expansion, its immense future and the adaptability of electricity to the needs of mankind make it vitally important to keep the industry in the hands of those experienced and skillful men to whose vision and labor its wonderful growth and performance are due. Executives and engineers have vied with each other in increasing efficiency and improving service, so that today no other commodity furnished to the public by utility companies is comparable to electricity in cheapness and adaptiveness. To keep the industry the pride of employees and community alike and to safeguard it against financial exploitation it is wise and prudent for executives to renew their interest in customer ownership and to raise as much money as possible by this means. Customer ownership begets public interest and keeps the management and the industry always on their toes.

## Maine at the Crossroads

SLOWLY public opinion progresses toward an escape from the impasse which has retarded hydro-electric development in Maine for nearly two decades. The law forbidding exportation of hydro power has not prevented many fine achievements in intrastate system and plant construction, but there is little question that a far greater development would have taken place had the Fernald act been modified when it became apparent that its object—the attraction of industries to the Pine Tree State—was not materializing on the expected scale. This aspect of the law now appears of less public interest than its relation to the debate over state as opposed to federal regulation of interstate business, and the recent decision of the United States Supreme Court in the Narragansett-Attleboro case has aroused much discussion in Maine and is being used by opponents of exportation to justify their position.

Among light and power companies in Maine the view seems to be general that exportation of surplus hydro-electric energy should be permitted under suitable state regulation. The constitutionality of the Fernald act appears open to question, but the utilities have preferred to wait for public opinion to become favorable to a change in the act instead of fighting it in the courts. It would seem that through the voluntary submission of interstate energy contracts to joint commission regulation on each side of the state line a *modus operandi* could be reached pending federal legislation authorizing regulation by such commissions as a delegated function from the national law-making body. Seekers of regulation by Washington are few indeed. While Maine stands at the crossroads of a new legislative session, substantial hydro-electric power developments with all their public benefits remain embalmed in paper, and the

present opportunity to safeguard control and profit by the exportation of surplus power now wasted or undeveloped ought to be very plain.

## An Opportunity to Double Business in Residence-Lighting Fixtures

FROM analyses of the lighting equipment in the wired homes of this country it has been estimated that one-third of the existing ceiling fixtures are thoroughly obsolete. If these were entirely replaced by modern fixtures in the next five years, the present business in ceiling fixtures would be doubled. Few merchandising fields have such an enormous potential increase awaiting development. Furthermore, the results of such a replacement would be of great benefit to the occupants of homes through the agency of better lighting. The central-station company, too, is bound to profit by customers who perhaps for the first time have come to realize that good lighting is a powerful factor in making a house a home.

How, then, may this business be doubled? Seven million homes in this country have been wired during the past five years. From reliable data it is learned that ten million ceiling fixtures were sold to new homes during 1926. Fifty million ceiling fixtures are necessary to replace obsolete fixtures in the homes at present wired. If a five-year program for the elimination of these obsolete fixtures were set up and successfully completed, the average replacement business would thus equal the present ceiling-fixture business in new homes. In a city of 100,000 inhabitants two million dollars' worth of this replacement business is available, based upon the lowest-priced acceptable fixtures.

But this doubling of the fixture business in the homes of the nation is based entirely upon ceiling fixtures. When it is remembered that there are only one-third as many wall brackets and portable lamps as there should be in the average home, it is seen that the fixture business has great possibilities. The way to develop this field is to make residence lighting desirable by means of fixtures which make the lighting comfortable. This means shaded and diffused light.

## Two-Edged Publicity on Power Transmission

JUDGING from past newspaper reports, the electrical industry may expect soon to hear that San Francisco is supplied with electricity from New York or vice versa. This announcement, having every attraction except that of truth, might please the lay reader; but it would be an extreme instance of a type of publicity which all judicious utility men hold to be ill-advised. Synchronizing adjacent systems is not a difficult engineering feat and is meaningless when no power is transmitted. Yet laymen visualize such a performance as power transmission over impossible distances. Consequently there is created in the minds of the public an utterly wrong impression of the present economic trends in the power business. Some imaginative scribe jumps up to give utterance to the thought that Argentine water power should be used to supply New Orleans at an invisible price to consumers, because water power costs no money and distance is no handicap to power transmission. Wild ideas along such lines may become sufficiently prevalent to float substantial stock issues under the impetus of clever and unscrupulous promoters.

Experience shows two trends in the industry which are a warning against raising false hopes of this kind in the minds of the public. One is that the economic distance for power transmission has been reduced very materially by recent economies in generating power from fuel. The other is that standards of service have increased and that continuous and reliable service in a power area requires that area to be self-sustaining in regard to the generation of energy. Relay or reserve power under emergency conditions, and not long-distance bulk-power transmission, is the primary transmission possibility of interconnected systems.

The white light of publicity is not the "all-in-all" for utilities when this light plays on distorted and unreal visions from the realms of Munchausen. The facts of electrical progress are surely dramatic enough. There is no need for newspaper men or ill-informed "boosters" to give a free rein to fancy.

## What the Courtiers Tell the King

SEVERAL weeks ago there appeared here an editorial making the point that though the old "public-be-damned" attitude has been pretty generally banished from the electric power industry, "the bad old companion policy of 'trade be damned' still festers." It asserted that hard feeling exists today in innumerable cities between the power company and the "local trade" —meaning the contractors and dealers—bred of the impatience of the power men over the weakness of the average contractor and dealer and the resentment of the trade over central-station commercial policies which it considers unjust. But the executives of the industry are far from agreeing that this is a true statement of an actual condition.

Many letters have been written by men prominent in central-station leadership. Some heartily agree and earnestly indorse the effort to focus attention on a matter of first importance to the electrical industry. Others express surprise, say that they "did not realize that the situation is so acute." Still others say that the editorial cannot refer to their locations and cite what they have done to aid co-operation. And because of their experience and standing those executives who agree and those who do not agree should be equally able to pass on the matter. Why is there this difference of opinion?

The reason is the same that has caused this policy of "the trade be damned" to linger. For the king hears what the courtiers tell him, and because nobody cares to carry bad news it is the most natural thing in the world that the executive of a large utility should often know but little of the real sentiment toward his company that exists among the "local trade." His own subordinates, when their administration has bred discontent, are not apt to advise "the old man" about it and often honestly do not recognize the cause. Also, the small contractor or dealer is more apt to compliment this man of power, on the rare occasions when they meet, than to complain and perhaps incur the disfavor of his organization. And so many an executive whose

most earnest desire is to promote the interests of the local trade is entirely oblivious to the true sentiment among them, confident in the belief that the policies of his company are entirely fair and popular. At the same time, there may be discord in the electrical family that is holding back the progress of the industry in that community. As a matter of fact, this very condition actually exists in many cities.

The trouble is that trade relations have never yet been rated as a major executive problem. Public relations have achieved that standing, but the fact that trade relations lie at the very heart of public relations has not yet been generally accepted. When the importance of a strong, healthy, prosperous trade begins to be more appreciated, the central-station executive will make trade relations his own concern and the trouble will end.

## Hindrances to Circuit-Breaker Development

COMMERCIAL development of any equipment is usually handicapped enough by monetary reasons and technical difficulties without allowing other controllable factors to serve as additional hindrances. As a case in point take oil circuit breakers. Extensive research and performance studies have been conducted and are being made which directly or indirectly cost considerable money. These investigations are being supported by co-operating manufacturers and a few large utilities.

Right here is one of the hindrances to further development. Only a few large utilities have accepted the hazard of allowing their systems to be subjected to the short-circuit current necessary for testing switches to destruction and have contributed man-power for the tests. Other operating companies have not so co-operated or do not have the generating capacity to permit them to do so. Still, all companies will benefit by the practical information obtained from these tests, and it should not be expected that a few companies will do all the co-operating that leads to further development. If they will not subject their systems to the hazard involved or have not the facilities needed, they can at least assist proportionately in other ways—by furnishing money or men. How this shall be done remains for the industry to decide, but equalization of the burden of field research is essential.

Another situation that certainly does not encourage development of oil circuit breakers is the insistence by some operating companies that all their oil circuit breakers be modified by the manufacturers gratis to conform with the conclusions reached after these field tests. In fairness to the utility industry, it can be said that some companies are not so unreasonable in their demands and offer to pay for the modifications. No manufacturer should be expected to modify without charge apparatus which has been sold in good faith just because subsequent field tests show that some improvement is necessary.

Manufacturers were once criticised editorially and otherwise for their unwillingness to divulge results of such field tests, but they have now agreed with at least one co-operating utility company to release the information to such companies as the co-operating utility agrees to name. Since this much progress has been made toward sorely needed circuit-breaker development, further improvement should not be delayed by refusal of any operating companies to pledge themselves to an equitable basis of supporting field research and to a discontinuance of requests for modifications at the expense of the manufacturers.

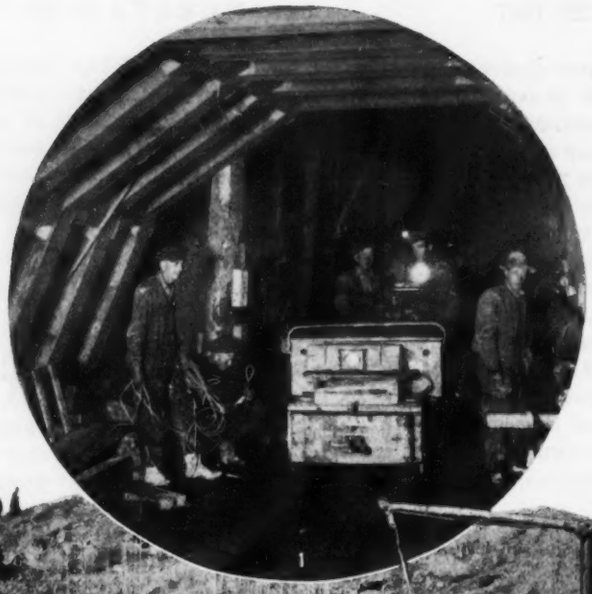
## Better and Lower-Priced Refrigerators Wait on Sales Volume

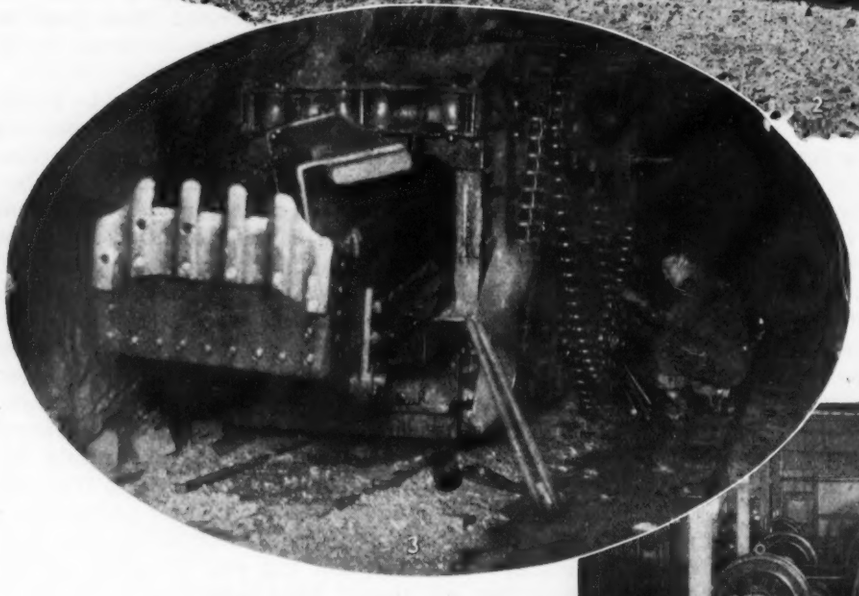
ALTHOUGH one electric refrigerator manufacturer has just announced price reductions under 1926 ranging up to 7½ per cent for cabinet models installed and up to 14 per cent for equipping existing boxes, power companies which have been slow to engage in the business on the theory that "machines will be cheaper and better next year" are very likely to be disappointed in their expectation of vast improvement in design or reduction of retail prices to values which they think would be more attractive. While it is in the realm of possibility that some new invention might at once revolutionize refrigeration methods and make possible the manufacture of a much cheaper machine, it is not probable. Electric refrigerator manufacturers for more than twenty years have worked in their research laboratories to produce a practical small refrigerating unit. There is little they have not tried, and the machines now on the market are the best that can be built after years of experimental and operating tests have eliminated faulty design, intricate mechanism and unreliable performance. Further improvements will be made, of course, but they will come gradually in the form of refinements incorporated from year to year only after conclusive tests prove them to be practicable.

Nor should too much hope for lower prices be predicated on the benefits of quantity-production methods which the manufacturers have adopted in their factories. Much of the savings thus effected has been passed on in price reductions already made. Additional price cuts, manufacturers declare, must come from savings made in the cost of distribution and sale of electric refrigerators, now the most expensive links in the chain from manufacturer to ultimate user. Just as quantity production in the factory made possible some lowering of prices, so will volume of business by retail outlets have to accomplish further reductions. It is not going to be longer discounts or arbitrary price cuts which will increase sales, but rather increased sales production by all selling outlets that will automatically earn better discounts, lower prices and—more profit. Of course, some manufacturer may have the courage to decide that the way to obtain volume business that will justify price reductions is to reduce prices first; but the ELECTRICAL WORLD'S recent survey indicated that most manufacturers and dealers do not believe such a move would be justified. The feeling is quite general that price reductions should follow increase in sales volume and not precede it.

Central-station companies which are waiting further developments in electric refrigeration before entering the field, or those which are worrying too much about price, are not only losing valuable time in getting at the promotion of a most profitable domestic load, but are actually helping to retard improvements and keep selling prices up.

# Use of Electricity in the Construction of the Moffat Tunnel



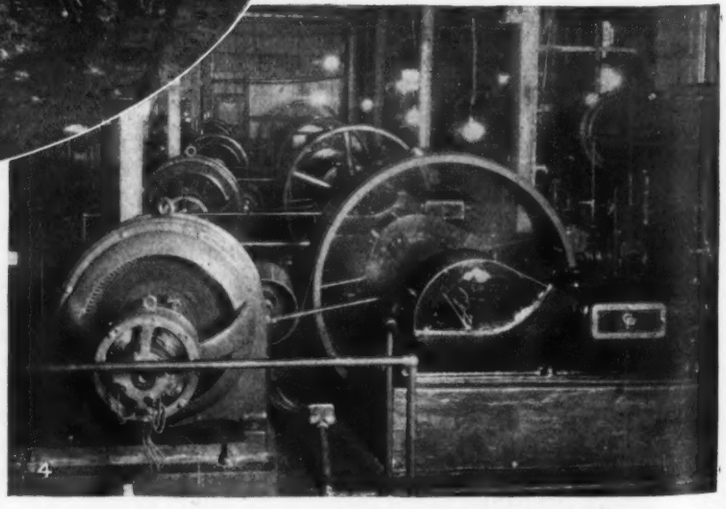


No. 1. A 4-ton battery locomotive.

No. 2. An 8-ton trolley locomotive hauling rock.

No. 3. An electric mucking machine.

No. 4. Four 200-hp. compressors furnishing air for pumping drilling, etc.



CONSTRUCTION of the Moffat Tunnel through the Rocky Mountains in Colorado, which is expected to be completed so far as tunneling is concerned some time this year, affords not a few examples of uses for electric power. Several of these applications are shown.

*Photos by News Bureau, General Electric Company, Schenectady, N. Y.*

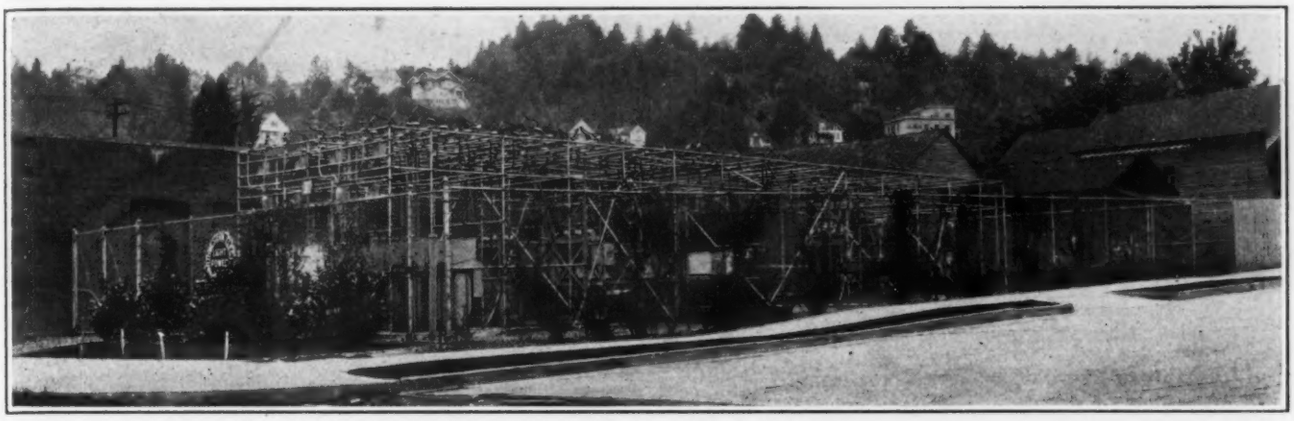


FIG. 1—PIPE-FRAME OUTDOOR SUBSTATION WITH WIRE FENCE

# Standardizing Distribution Substations

## Systematic Distribution Planning Leads to Adoption of Standard Substations—Ultimate Capacity of Each Established at 6,000 Kva.—3,000-Kva. Units to Constitute Initial Installation—Costs Given for Each Type

By E. F. PEARSON and TOM PERRY

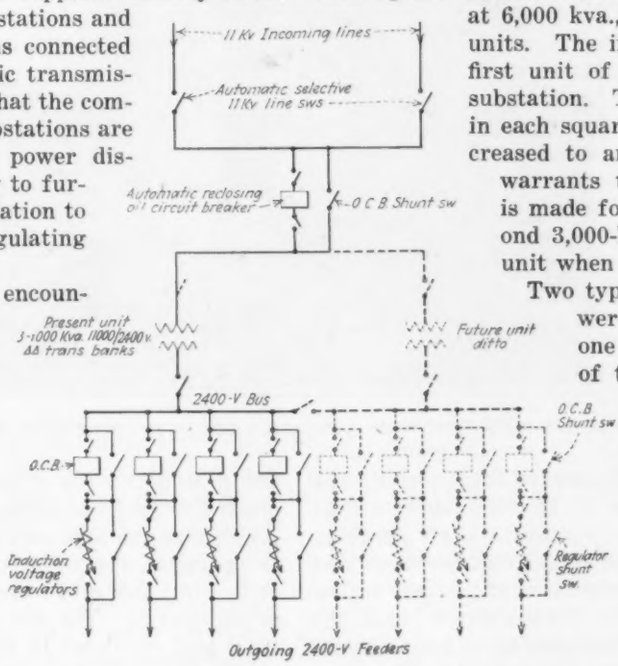
*Electrical Engineer and Superintendent of Plant Department, respectively, Northwestern Electric Company, Portland, Ore.*

AS A RESULT of a careful study of ultimate distribution needs, three types of distribution substations for use outside of the downtown business district of Portland, Ore., have been designed and adopted by the Northwestern Electric Company. All heavy power on this system is supplied from a 66,000-volt or an 11,000-volt, 60-cycle, three-phase looped network. Lighting, appliances and small power load are fed from a 2,400-volt, three-phase, 60-cycle network.

The 11,000-volt network is supplied directly from two steam-electric generating stations and from two principal substations connected to the hydro and steam-electric transmission system. Due to the fact that the company's principal plants and substations are adjacent to heavy industrial power districts, it is comparatively easy to furnish satisfactory voltage regulation to large power consumers by regulating station buses.

A more difficult problem is encountered with modern lighting, electric range and general heating appliance load, which demands very close voltage regulation. For this reason and as a result of a comprehensive study, it was decided that, in order to provide the proper control and regulation for the 2,400-volt system, it would be necessary in the ultimate plan to locate a regulating substation in the center of each square mile of territory outside of the downtown business district. The study was based on an ultimate lighting, heating and small power load of 6,000 kva. per square mile in the outer districts, with a probable ultimate load of 12,000 kva. per square mile in the heavy apartment house and hotel districts. The territory being competitive, it was assumed that this load would be divided with approximate equality between the two competing companies.

The ultimate capacity of a substation to take care of each square mile of territory was therefore established at 6,000 kva., divided into two 3,000-kva. units. The initial installation calls for a first unit of 3,000-kva. capacity at each substation. The first unit is not installed in each square mile until the load has increased to an amount that economically warrants that installation. Provision is made for the installation of the second 3,000-kva. unit adjoining the first unit when needed.




WIRING DIAGRAM OF TYPICAL 6,000-KVA. OUTDOOR DISTRIBUTION SUBSTATION

Two types of permanent substations were designed for this service; one of these, shown in Fig. 3, is of the indoor type housed in a concrete building faced with brick and cast stone in order to harmonize with the better type of residence districts. Exclusive of land value, the completed substation of this type will cost approximately $21 per kilovolt-ampere of capacity. The second type, shown in Fig. 1, is of outdoor pipe-frame construction and is at present used

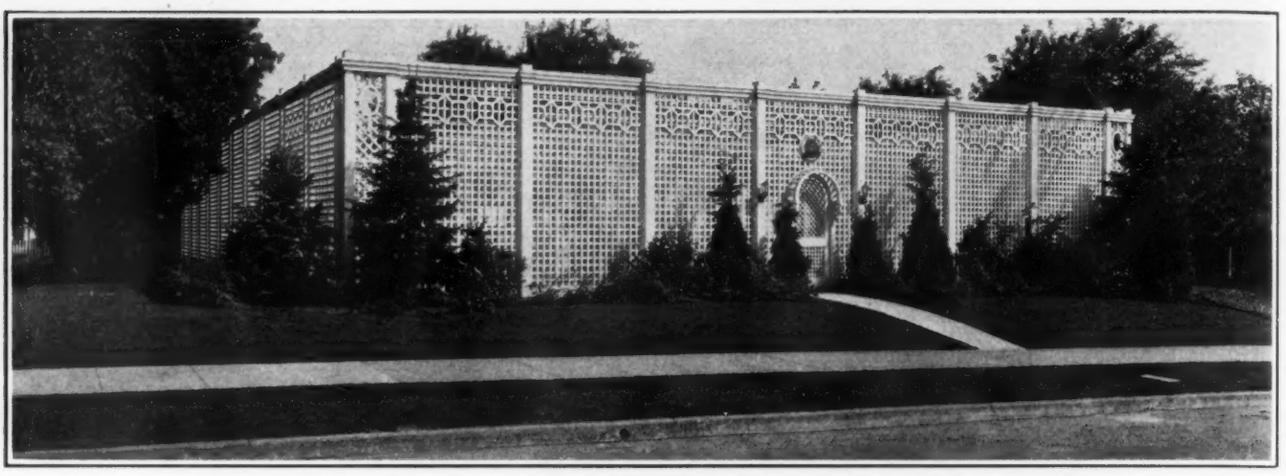


FIG. 2—DISTRIBUTION SUBSTATION BEAUTIFIED WITH LAWN, SHRUBBERY AND LATTICE FENCE

in industrial and lower class residence districts. A completed substation of this type will cost approximately $16.50 per kilovolt-ampere of capacity with iron-wire fence. If the lattice type of fence shown in Fig. 2 is used, the cost will be about $16.90. Both types of substations are identical in capacities. The first unit of each includes a bank of 3,000-kva., 11,000 to 2,400-volt, three-phase, 60-cycle transformers.

Each substation is supplied with two 11,000-volt, three-phase feeders from different sources. The 11,000-volt supply is controlled by full automatic selective transfer, so that in case of failure of one source of supply the station is automatically transferred to the second source. Each unit supplies four outgoing 840-kva., 2,400-volt, three-phase feeders. Each feeder is equipped with two 200-amp., single-phase induction feeder regulators, which maintain constant voltage at the feeder distribution center through use of line-drop compensators. Provision is made for adding the third regulator to each feeder and cutting the feeders over to 4,000 volts Y at such time in the future as economic reasons warrant. Each outgoing feeder is protected with automatic circuit breakers, and the ultimate plan includes installation of periodic reclosing equipment on each feeder. Such stations are in the overhead districts, but all circuit entrances and exits are in underground cable from the terminal pole. This simplifies the structure and greatly improves appearance.

In the extreme outer districts load builds up slowly,

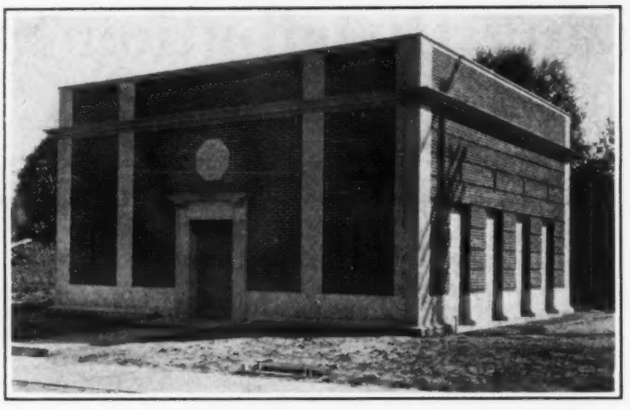


FIG. 3—INDOOR TYPE PERMANENT DISTRIBUTION SUBSTATION

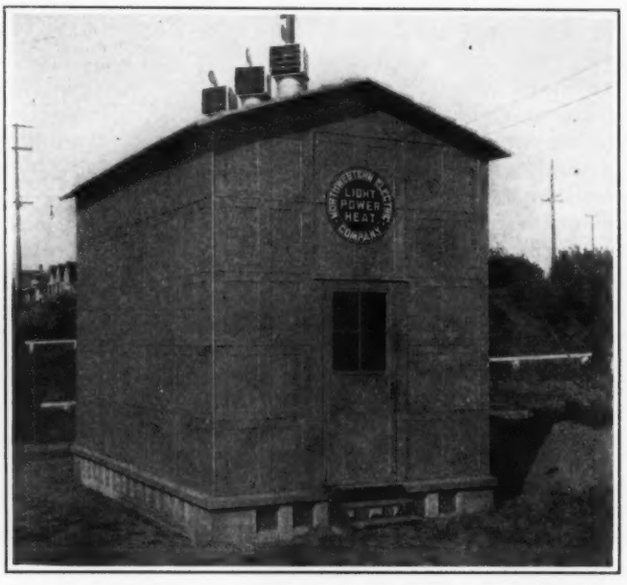



FIG. 4—SEMI-PORTABLE SUBSTATION FOR OUTLYING DISTRICTS

and where the first 3,000-kva. unit is not warranted at first a third type of substation has been provided (see Fig. 4). This consists of an indoor type semi-portable substation with a maximum capacity of 840 kva. as governed by transformers and induction feeder regulators. Such a station is served with one 11,000-volt line and provides one outgoing 2,400-volt, three-phase feeder of 840-kva. capacity regulated with two 200-amp. induction feeder regulators. The equipment is housed in a small steel building of the ready-made type, and the building is mounted on a heavy structural steel base supported with four concrete pillars. The building and steel base are so constructed as to make the complete unit portable. Removable ventilating louvers beneath the building are of precast concrete and metal screen.

The semi-portable building is set up on the rear of property purchased for future accommodation of a standard substation. When the load has grown to a point approaching the capacity of this substation, the first unit of a standard permanent substation is erected on the front of the property adjacent to the street. As soon as the first unit of the permanent substation is in operation the semi-portable substation can then be moved to a new site without dismantling either building or apparatus. The structural steel base supports the total load of about 15 tons of building and apparatus, and this can be readily transported to a new site by means of a heavy-duty tractor and trailer. The semi-portable station will cost approximately $14.75 per kva.

# A Solution of the Library Lighting Problem

## Conditions that Existed in the Engineering Societies Library—Changes that Have Been Made—Data and Personal Reactions on Effects Produced

By M. M. SAMUELS* and JAMES T. HOLMES†

AN ILLUMINATION problem that was recently satisfactorily solved in the Engineering Societies library, New York City, gives promise of being of general interest, because the unsatisfactory conditions that existed in the library prior to the new installation are paralleled in many other public and private places. Furthermore, the rather novel methods employed in solving the problem can profitably be used for many other cases.

The original lighting installation was probably the best that could be had at that time—no doubt better than many other installations then existing. Both the employees and the reading public were satisfied and no complaints were forthcoming. But since then the art of illumination has made great strides and both reading public and employees have become more and more educated to the use of good illumination, with the result that the director of the library in the last few years had been receiving many complaints about the unsatisfactory conditions of illumination. Some attempts were made to improve the conditions, but they were of a palliative nature and brought about very little improvement. New types of inclosing units for the overhead fixtures, as well as new types of reflectors for the table lamps, were tried out, but the improvement was only slight. During 1924-25 the library committee finally took the initiative and caused a thorough investigation to be made of the existing conditions, as well as of the possibilities of radical improvements.

### CONDITIONS THAT EXISTED

As may be readily seen in Fig. 5, the library is subdivided into twelve sections, four reading sections on each side and four file sections in the center aisle. Each reading section consists of a reading space on the main floor and an elevated reading gallery around the sides, leaving the main portion of the lower reading space open to the ceiling, which is arched. The architecture is classical with a suggestion of the Adam school, and the finish is a pleasing light horn color. There is one large reading table on the main floor, which was equipped with two double-arm reading lamps, making a total of four 25-watt reading units. In addition there was one 300-watt decorative inclosing unit suspended from the ceiling in the center of each arch. (This unit will hereafter be designated as fixture No. 1.) In one of the alcoves a new type of inclosing unit (fixture No. 2) had been installed, fitted with a 300-watt lamp, and new reflectors had been installed on the table lamps.

The accompanying tests showed the condition after these changes to be even worse than was expected. Although fixture No. 2 showed an efficiency (Fig. 4) almost twice that of fixture No. 1, it was still inadequate. The distribution of illumination across the room with all alcoves equipped with fixture No. 1 (Fig. 9) shows an average of about 1½ foot-candles, absolutely insufficient for present requirements, and similar measurements with fixture No. 2 showed an average of about 2½ foot-candles, likewise recognized as insufficient. Turning on the table lamps not only failed to improve the situation but because of the extreme contrasts actually made the reading conditions worse.

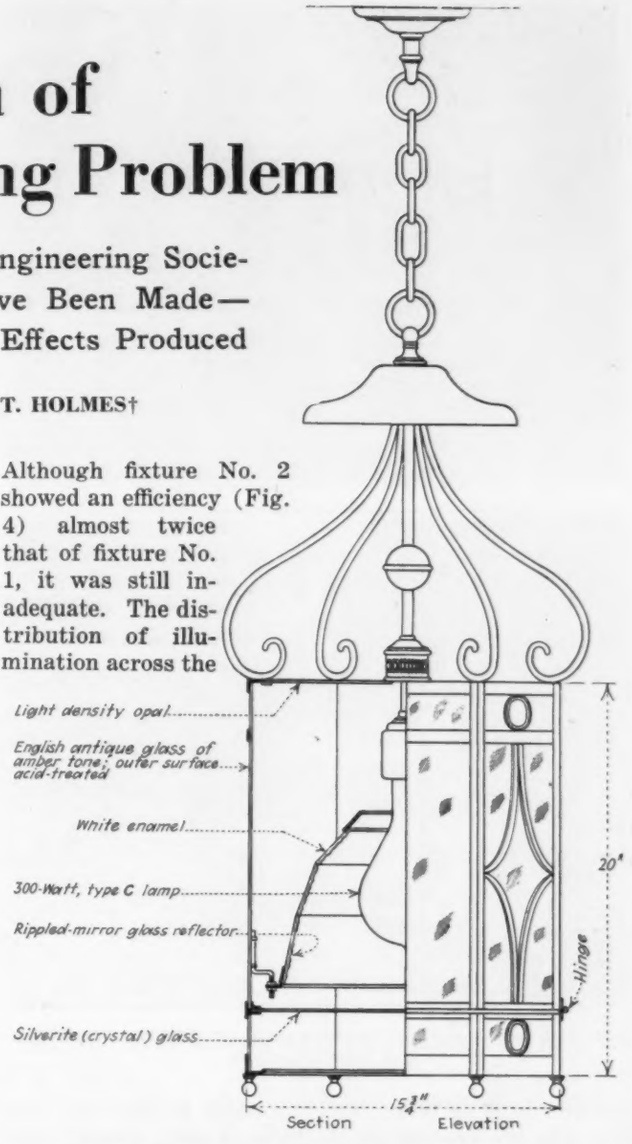
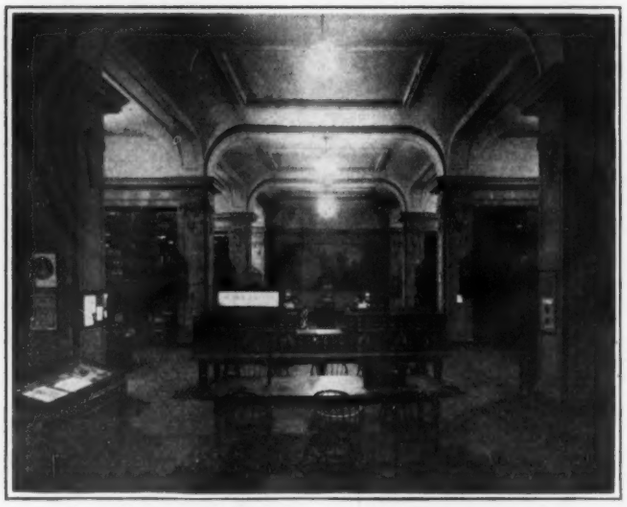


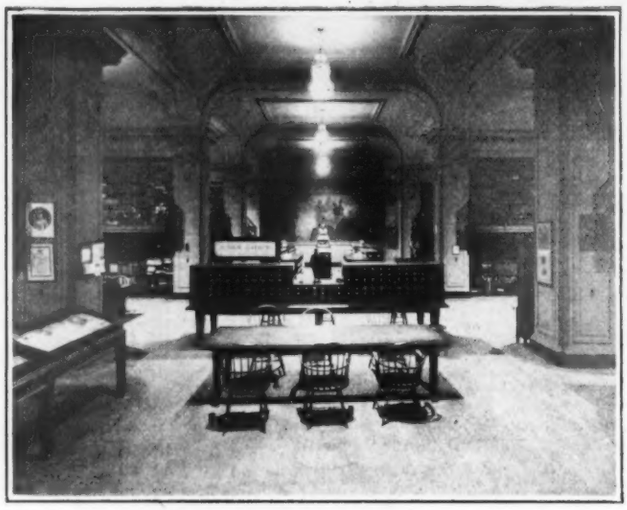

FIG. 1—CONSTRUCTION OF NEW FIXTURE‡ NOW USED IN LIBRARY

With the old table lamps added, it will be noted in Fig. 6 that the illumination dropped from 15 foot-candles to 8 foot-candles, or 46 per cent, in a distance of 1 ft. With new reflectors on the table lamps, the illumination dropped from 32 to 18 foot-candles, or 44 per cent, in a distance of only 6 in., and from 32 to 9 foot-candles, or 72 per cent, in a distance of 2 ft.

Although it is true that the human eye will adjust itself to almost any intensity above a certain minimum if such intensity is reasonably uniform and of good quality, it will not adjust itself, without injury, to such variations on a reading surface as 44 per cent in a

*The J. G. White Engineering Corporation.
†The Frink Company.
‡Patent pending.





FIGS. 2 AND 3—GENERAL APPEARANCE OF LIBRARY WITH OLD AND NEW LIGHTING

distance of 6 in. (see tests). Added to this was the fact that the readers on the balcony were greatly disturbed by direct glare issuing from the old ceiling unit.

It was at once obvious that satisfactory restful reading was impossible under such conditions and immediate radical changes were imperative to provide lighting that

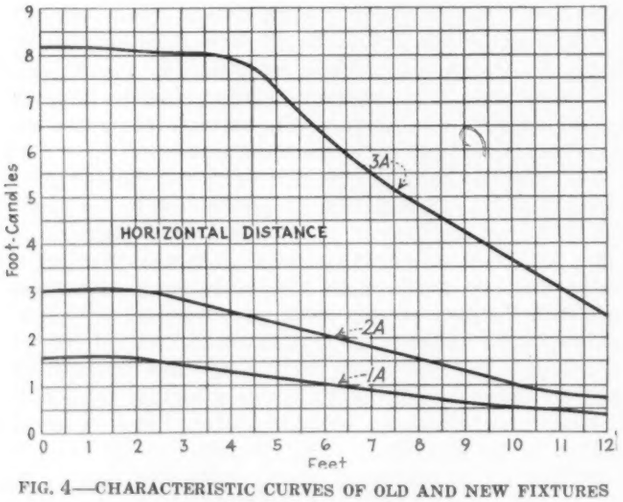



FIG. 4—CHARACTERISTIC CURVES OF OLD AND NEW FIXTURES ON READING TABLE

Curve 1 *A* refers to fixture No. 1; curve 2 *A* to fixture No. 2; and 3 *A* to the new fixture.

would be adequate for a national institution such as the library of all the engineering societies.

Cove lighting first suggested itself, because the arches are so constructed that it would have been possible to install it; but the ceiling is altogether too dark for cove lighting, and to make it brighter would have meant to

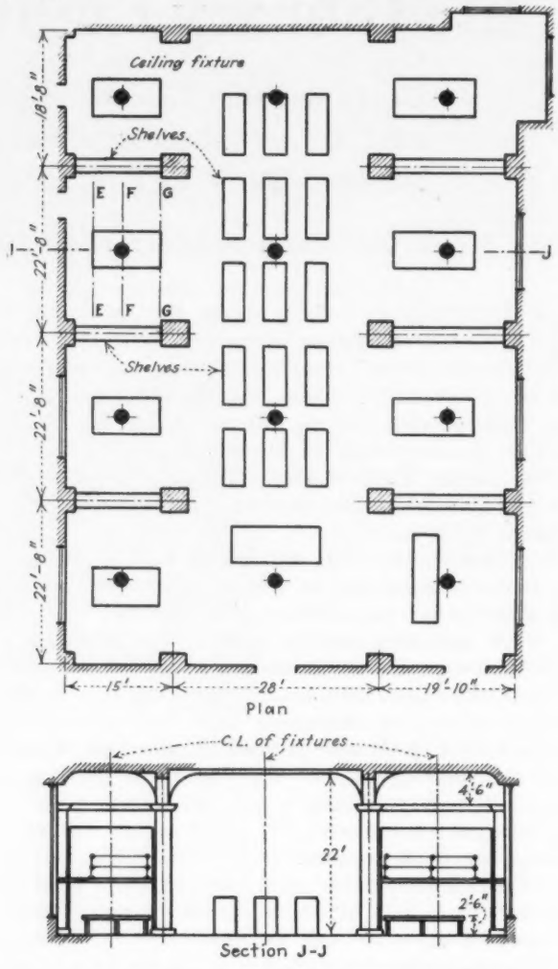



FIG. 5—LAYOUT OF ENGINEERING SOCIETIES LIBRARY INDICATING LIGHTING REQUIREMENTS

disturb the basic architectural idea of this particular interior. Furthermore, both installations and maintenance costs would have been altogether too high. But, most important of all, the atmosphere produced by cove lighting is much too cold for library purposes. For similar reasons totally indirect or even semi-indirect illumination could not be considered, and the problem resolved itself into one of direct illumination. The market was thoroughly scoured and it was found that no existing standard fixture was adequate for the purpose. A fairly good typical inclosing unit (fixture No. 2) was tried out, but it is obvious from the data given that it did not give promise of sufficiently improving the conditions.

A new fixture (fixture No. 3, Fig. 1) was therefore designed. The underlying idea was to produce a design of lantern that, while in complete harmony with the interior, would provide enough light on the reading tables in the alcoves to permit their continued use without the necessary adjunct of the local lighting fixtures then installed. In addition the lantern must be so constructed that the brightness of the sides would be extremely low and not detract in any way from the

quiet, restful atmosphere of the room. All this must be done by means of a single lamp.

The design finally decided upon involves the following parts: A central light source or lamp, a surrounding reflector directing the light downward, a diffusing panel

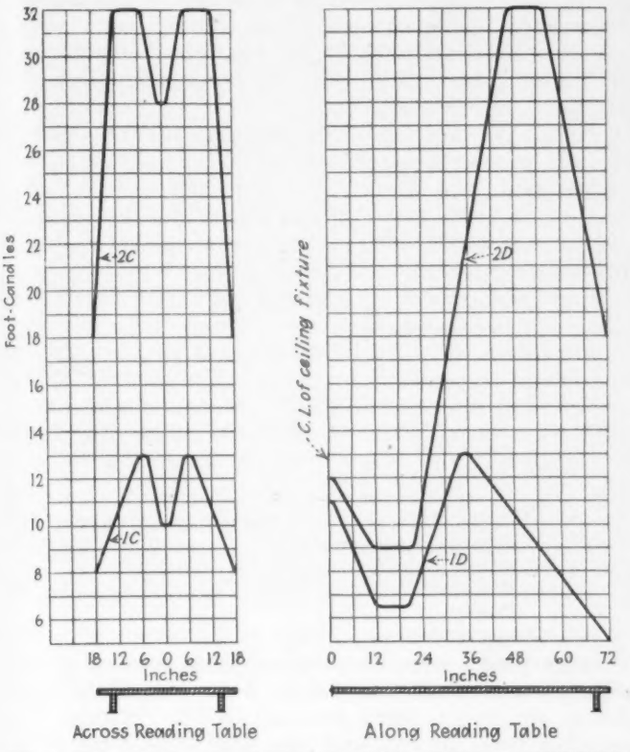
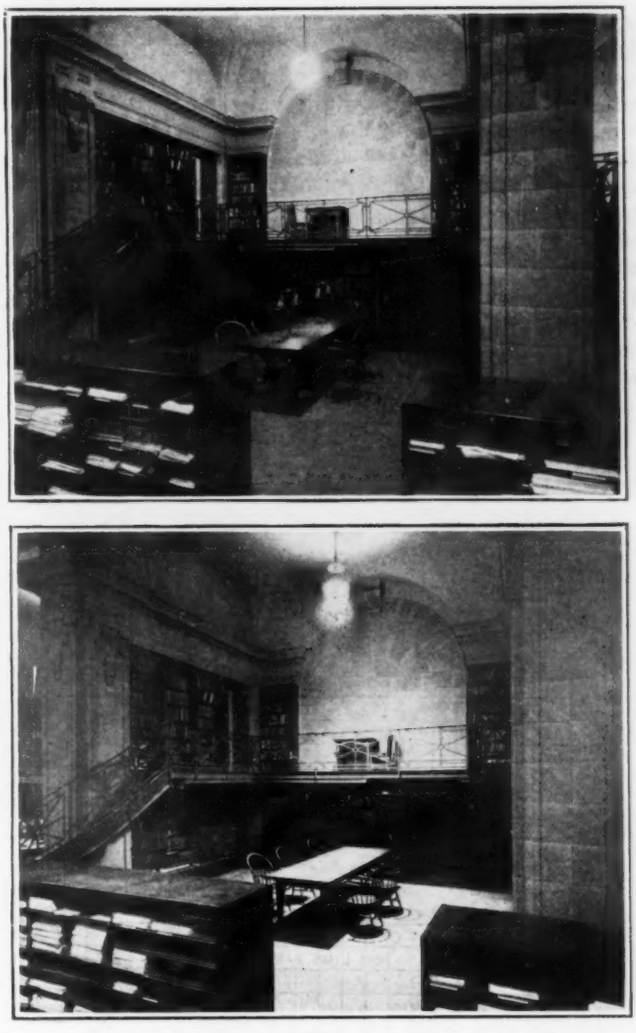



FIG. 6—ILLUMINATION ON READING TABLE WITH OLD FIXTURES AND TABLE LAMPS ADDED

Curves 1 *C* and 1 *D* represent conditions with fixture No. 1 and old lamps added respectively; curves 2 *C* and 2 *D* represent conditions with fixture No. 2 and new reflectors on table lamps respectively.



FIGS. 7 AND 8—ALCOVES WITH OLD AND NEW LIGHTING

beneath this to enlarge the apparent source of light and reduce the intrinsic brightness, a surrounding cylinder of translucent glass of suitable texture and colored to harmonize with the woodwork and, finally, an upward component producing a soft light intensity on the ceiling. The reflector directs the largest part of the light flux toward the downward diffusing panel, while a part of the upward flux from the lamp is permitted to reach a light opal screen at the top. This screen, in turn, redirects part of the light to the outside of the reflector, which is coated with a diffusing white paint for the purpose of illuminating the sides of the lantern. The opal screen at the top serves entirely to eliminate shadows of the lantern structure that might otherwise occur on the ceiling. To conceal the brilliant lower panel effectively the sides of the lantern have been extended to form a skirt. The bottom panel, including this skirt, has been hinged to permit access for cleaning and relamping.

The result is a lantern pleasing to look upon and of such brightness as not to overlight the upper structure of the library. In fact, a practically even intensity is confined to the reading tables and a much better effect is had without the local reading lamps than was previously obtained with them.

It was possible to install the new fixture in the existing outlets without any change whatever in the wiring.

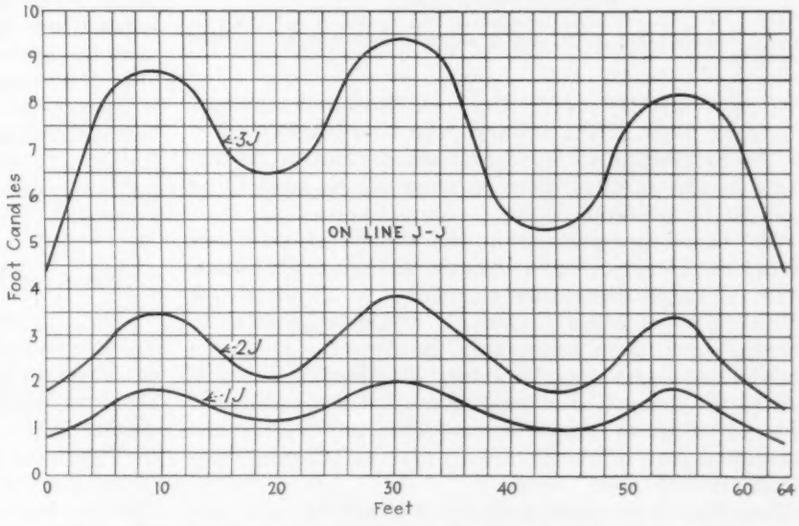



FIG. 9—ILLUMINATION ACROSS LIBRARY ON PLANE OF READING TABLES FOR OLD AND NEW FIXTURES WITHOUT TABLE LAMPS

Curves 1 *J*, 2 *J* and 3 *J* refer to fixture No. 1, No. 2 and new fixture respectively. The valleys in the curves occur in aisles and are consequently not objectionable.

All table lamps have been removed, thus reducing the load in the library by 100 watts per alcove, or 25 per cent, since the new units are equipped with the same size lamps (300-watt) as the old ones. At the same time the average intensity on the main reading tables is now 8 foot-candles, as against an average of 1½ foot-candles that prevailed with old ceiling fixtures turned on and the table lamps off, or an increase in efficiency of 430 per cent. The distribution is quite uniform and will make it possible, if necessary, to provide additional reading space in each bay. There is no glare whatever on the gallery; the almost uniform intensity on the gallery reading table is 4½ foot-candles and there is even sufficient vertical illumination on the upper book-

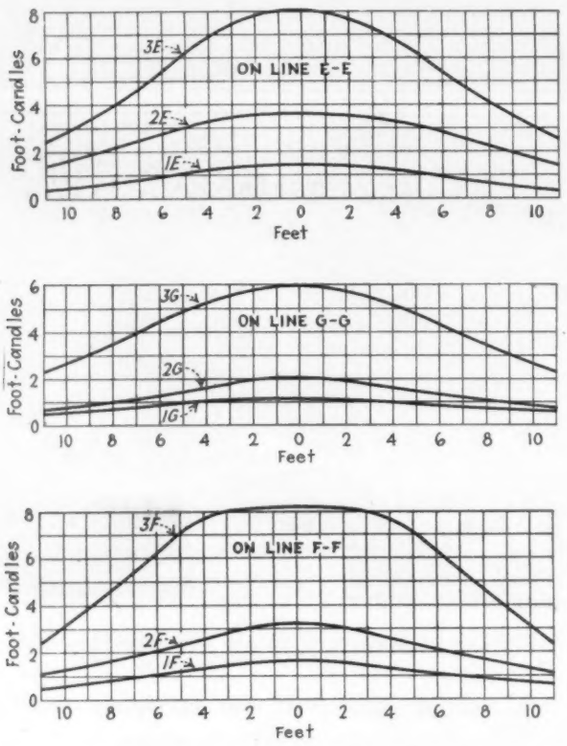



FIG. 10—ILLUMINATION ACROSS ONE ALCOVE ON PLANE OF READING TABLE FOR OLD AND NEW FIXTURES WITHOUT TABLE LAMPS

Curves 1, 2 and 3 refer to fixtures No. 1, No. 2 and the new fixture respectively; *E*, *F* and *G* refer to positions of readings (see Fig. 5).

shelves to identify clearly the book titles and numbers. The card filers at the library, who never before could do the cataloging at night and always had to do this work in the daytime, now do most of the card filing at night by preference.

The ideas incorporated in the design of this new fixture can be employed in virtually all high auditoriums. When a large decorative chandelier is required for architectural or other reasons, it would be possible to provide such a reflector unit in the center of the chandelier to provide satisfactory illumination in addition to the decorative effects. Even for low ceilings it is possible so to shape the reflector as well as the decorative part of the fixture to give satisfactory illumination.

However, it is very doubtful whether it will ever be possible to bring out a standard unit, based on these ideas, and it will probably always be necessary to design the fixture carefully, particularly the reflector, for each individual case.

## British Power Consumption Shows Striking Increase

THE extent to which Great Britain's production and employment of electricity are increasing is shown in the annual report recently presented by the British Electricity Commissioners. For Britain as a whole the sales of electricity by all authorized distributors in 1924-25 averaged 117 kw.-hr. per capita, compared with only 88 during 1922-23.

During the two years 1924 and 1925 Britain's capacity for producing electricity was increased by about 20 per cent. At the end of that period the total generating capacity was 3,723,514 kw. Of the 494 authorized undertakings covered, 281 are municipal and 213 private companies.

Since the period of severest industrial depression (1921-22) there has been an increase of 71 per cent in the energy sales for lighting and domestic purposes and nearly 68 per cent for power. During 1924-25 the energy sales ran to 5,097,000,000 kw.-hr., of which local authorities contributed 64 per cent and private companies 36 per cent. Classifications of sales follow:

| Purpose | Percentages of Total Sales |
|---|---|
| Lighting and domestic | 20.3 |
| Public lighting | 1.6 |
| Traction | 8.8 |
| Power | 69.3 |

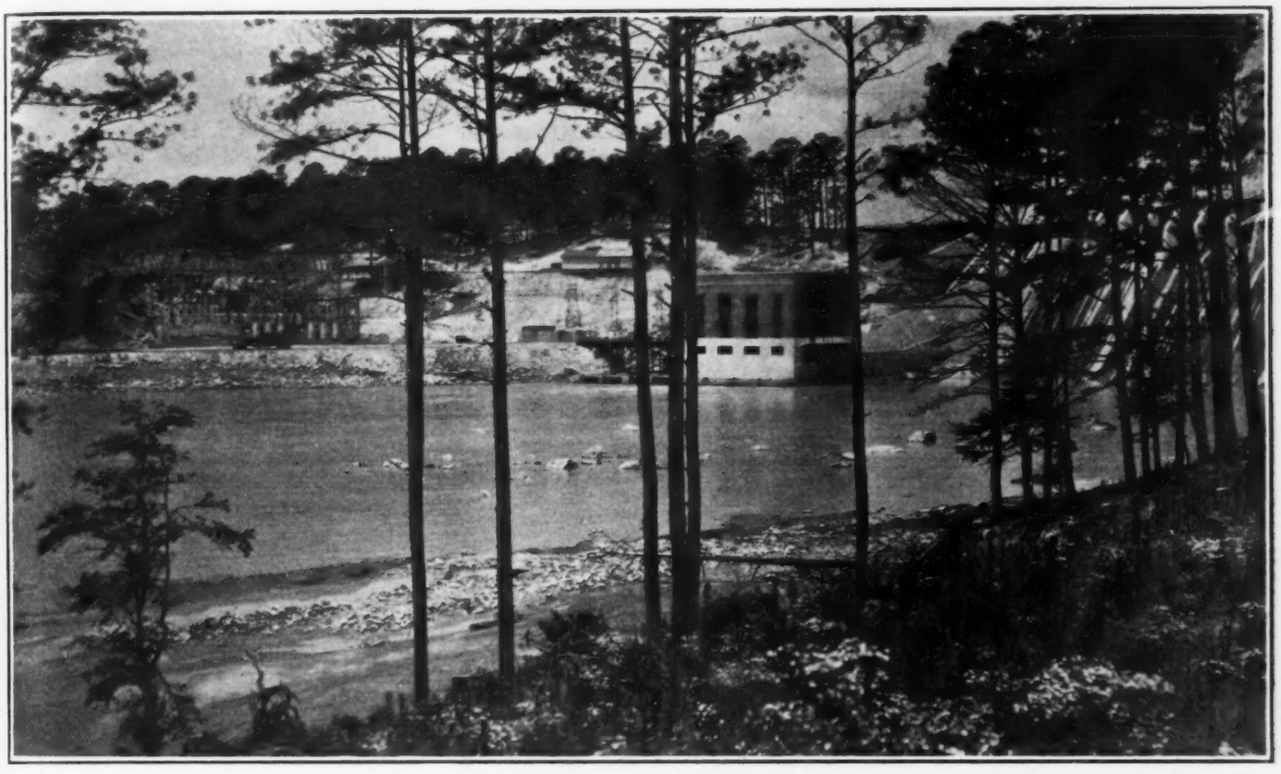
Steam plants occupy a predominating position in the generation of energy, only about 2 per cent of the total energy generation being provided by other plants. The principal fuels are coal and coke. In 1923-24 the average fuel consumption per unit generated was 2.71 lb., compared with 2.55 lb. during the following year. Accompanying the reduction in fuel consumption there has been a progressive reduction since 1921-22 in operating expenses per kilowatt-hour sold. According to this report, the cost of generation represents about 50 per cent of the operating expenses of supplying service.

From a comparison with the data recorded in the previous report the revenue per £100 ($500) of capital expenditure has shown a progressive decrease each year from £24.6 in 1921-22 to £21.1 in 1924-25, although the ratio between the energy sold and the total capital expenditure has shown a steady increase. The fact that the annual revenue has increased at a slower rate than the annual sales is attributed to rate reductions.

Appropriation from local authorities to relieve rates represented net contributions of £640,343 ($3,201,215) in 1923-24 and £751,249 ($3,756,245) in 1924-25, or 5.8 per cent and 6.8 per cent respectively of the gross surplus.

## France Extends Electric Distribution

THE Syndicats Intercommunaux des Cantons de Bray-sur-Seine et de Donnemarie have lately placed contracts with the Société Energie Industrielle of Paris for a considerable extension of the electric distribution system in the Department of Seine-et-Marne. The contract includes 80 miles of high-tension mains, 62½ miles of low-tension mains and 65 transformer cabins. The Energie Industrielle company is also about to erect a transmission line, supported on ferro-concrete masts, between Nangis and Montereau to connect the general distribution system with the power station at Montereau.



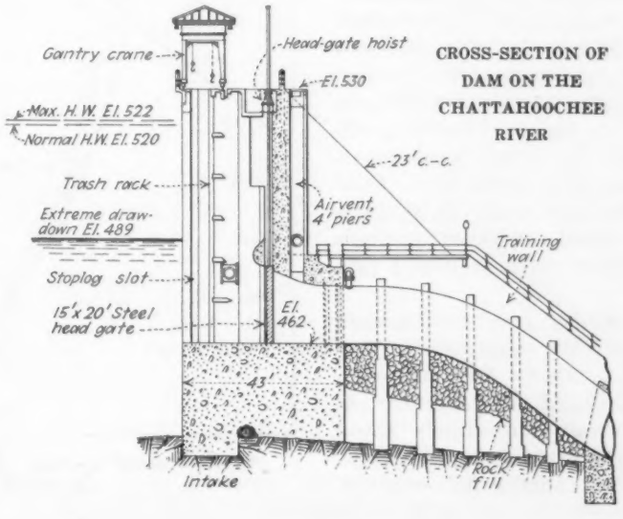
POWER HOUSE AND SUBSTATION OF COLUMBUS ELECTRIC & POWER COMPANY'S PROJECT

# South Develops Another Hydro Resource

## Project on Chattahoochee River Between Georgia and Alabama, with Initial Capacity of 30,000 Kw. and Ultimate of 60,000 Kw., Operates Under an Average Effective Head of 112 Ft.

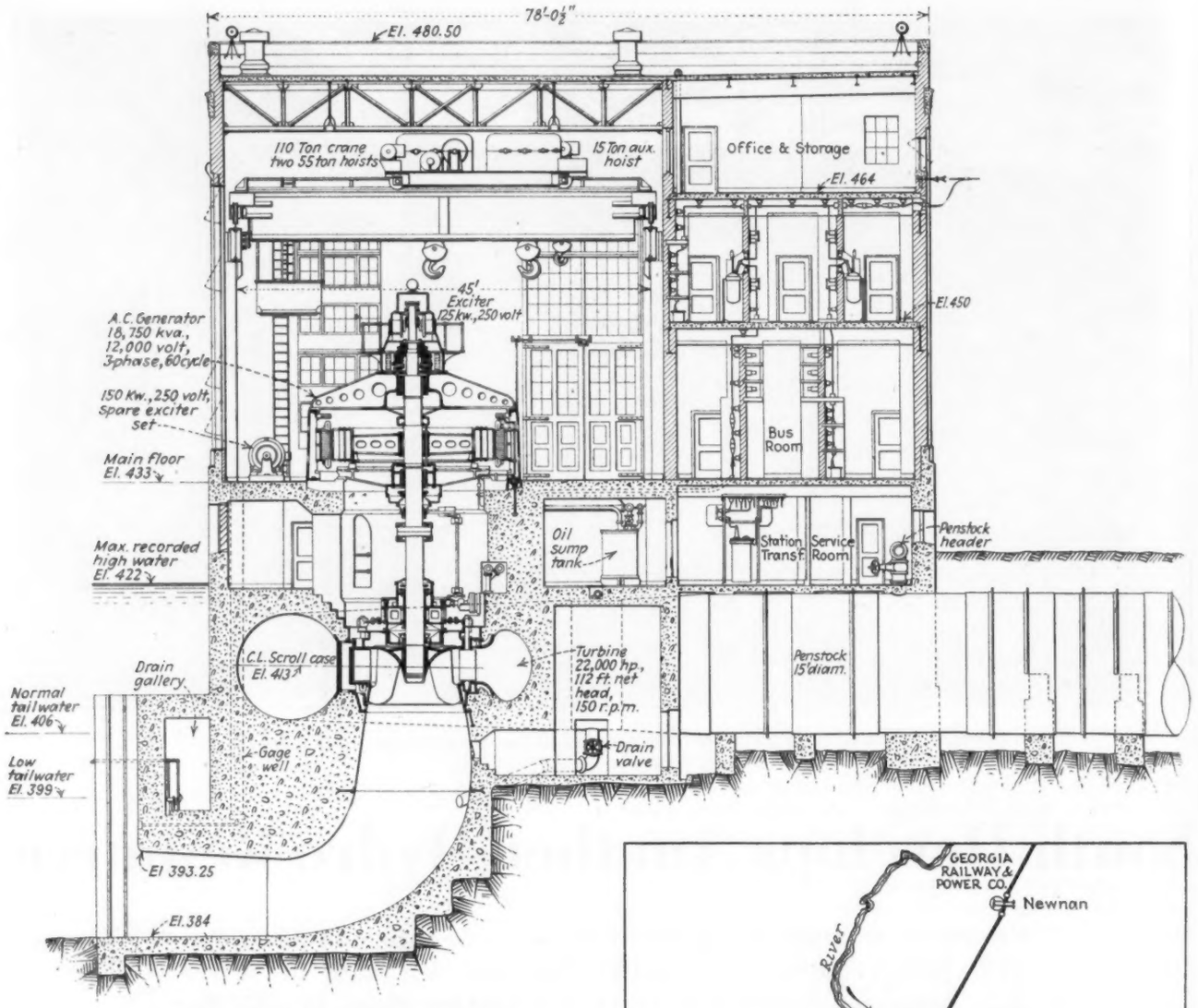
THE Columbus Electric & Power Company during the past year has placed in operation its Barlett's Ferry plant, located on the Chattahoochee River about twenty miles north of Columbus, Ga. Down to Bartlett's Ferry this river has a drainage area of about 4,200 square miles. Data collected by the United States Geological Survey about twenty miles upstream from the site show the average run-off to be 1.9 cu.ft per second per square mile, unevenly distributed throughout the year. Flows of more than 40,000 cu.ft. per second occur several times during an average year. A discharge of at least 2,000 cu.ft. per second is available 90 per cent of the time, though there are times of extended drought.

The dam has a maximum height above bedrock of 145 ft. and a total length of 1,975 ft. over all. Of this distance, 634 ft. is concrete spillway, 92 ft. concrete intake structure and the remainder earth embankment. The regulating structures on the crest of the dam include nineteen tainter gates, two skimmer gates and a battery of four siphon spillways. The tainter gates allow for flood flow, the skimmer gates permit manual regulation and disposal of trash, and the siphons are designed to regulate automatically the reservoir level for small increments of stream flow. There are also four sluiceways through the base of the dam.




CROSS-SECTION OF DAM ON THE CHATTAHOOCHEE RIVER

The power house is about 300 ft. downstream from the intake and measures about 90 x 80 ft. in plan, allowing a unit spacing of 42 ft. 8 in. The superstructure is

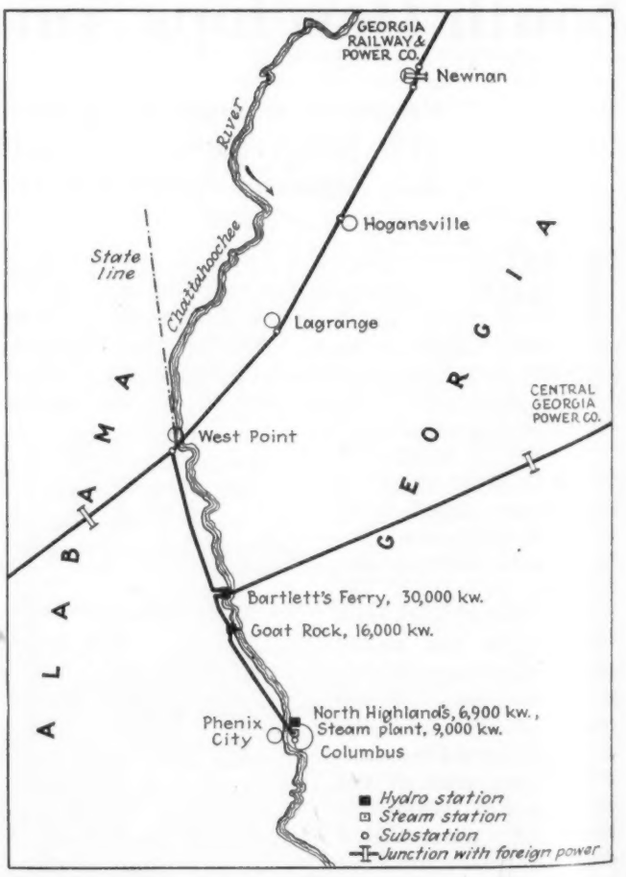



ARRANGEMENT OF POWER HOUSE EQUIPMENT

divided longitudinally into two sections: the generator room, 47 ft. wide by 47 ft. high, and the electrical bay, 25 ft. wide by three floors high. On the first floor of the latter are the station-service switchboard and accessories, the low-tension bus compartments and a locker room. On the second floor are the station switchboard and control room, the battery room and additional bus compartments. The third floor is devoted to storage and office space. The west end of the building is closed by a temporary wall to permit extension of the station.

Two 22,000-hp. single-runner vertical Francis-type turbines are provided, which are designed for best efficiency under a head of 112 ft. The draft tubes are of the elbow type, flattening horizontally at the turn. Connected to the turbines are two 12,000-volt, 18,750-kva., 150-r.p.m. generators with direct-connected exciters rated at 125 kw. A motor-driven spare exciter is provided.

The generator neutrals are solidly grounded through a neutral bus and differential relay protection is provided. Generator cooling air is drawn from the generator room and discharged through the generator pit and openings in the outside wall immediately above the tailrace. This reversal of the usual cooling arrangement is to insure a cool station during hot weather.




TRANSMISSION SYSTEM OF THE COLUMBUS ELECTRIC & POWER COMPANY

The control switchboard is located on the second floor of the electrical bay, with a bay window overlooking the generator room. A benchboard of four panels supports the instruments and control for the generators, exciters and 12-kv. and 110-kv. feeders. The relay and metering equipment is mounted on a vertical board directly behind the benchboard.

The station-service switchboard is in a room immediately below the control room, but the important station-service circuits are remote-controlled from the main control room. A single 12,000-volt generator bus and a single excitation bus are provided. The generator bus is on the generator floor level with the main circuit breakers on the floor directly above.

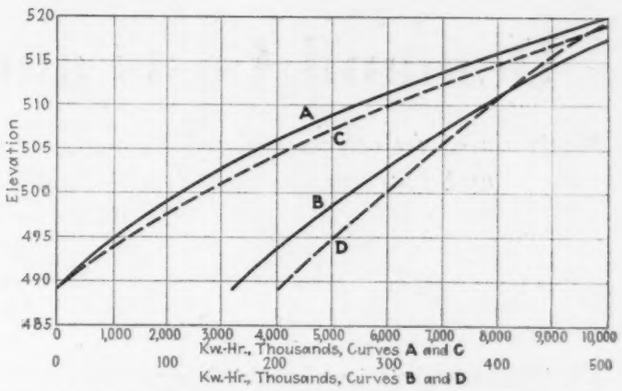
The 575-volt station-service power is obtained from two transformer banks, each composed of three single-phase transformers. The station auxiliaries are controlled by double-throw switches adjacent to the motors, the motors having two distinct sources of power from the station-service switchboard. The motor-driven auxiliaries at the dam have two sources of power distributed through a service room at the intake.

Power for station lighting is obtained from a 50-kva., 575/220/110-volt transformer, automatic switches providing emergency lighting from the 125-volt control battery. The dam is lighted by means of flood lamps on the gantry crane and at the top of the generating station.

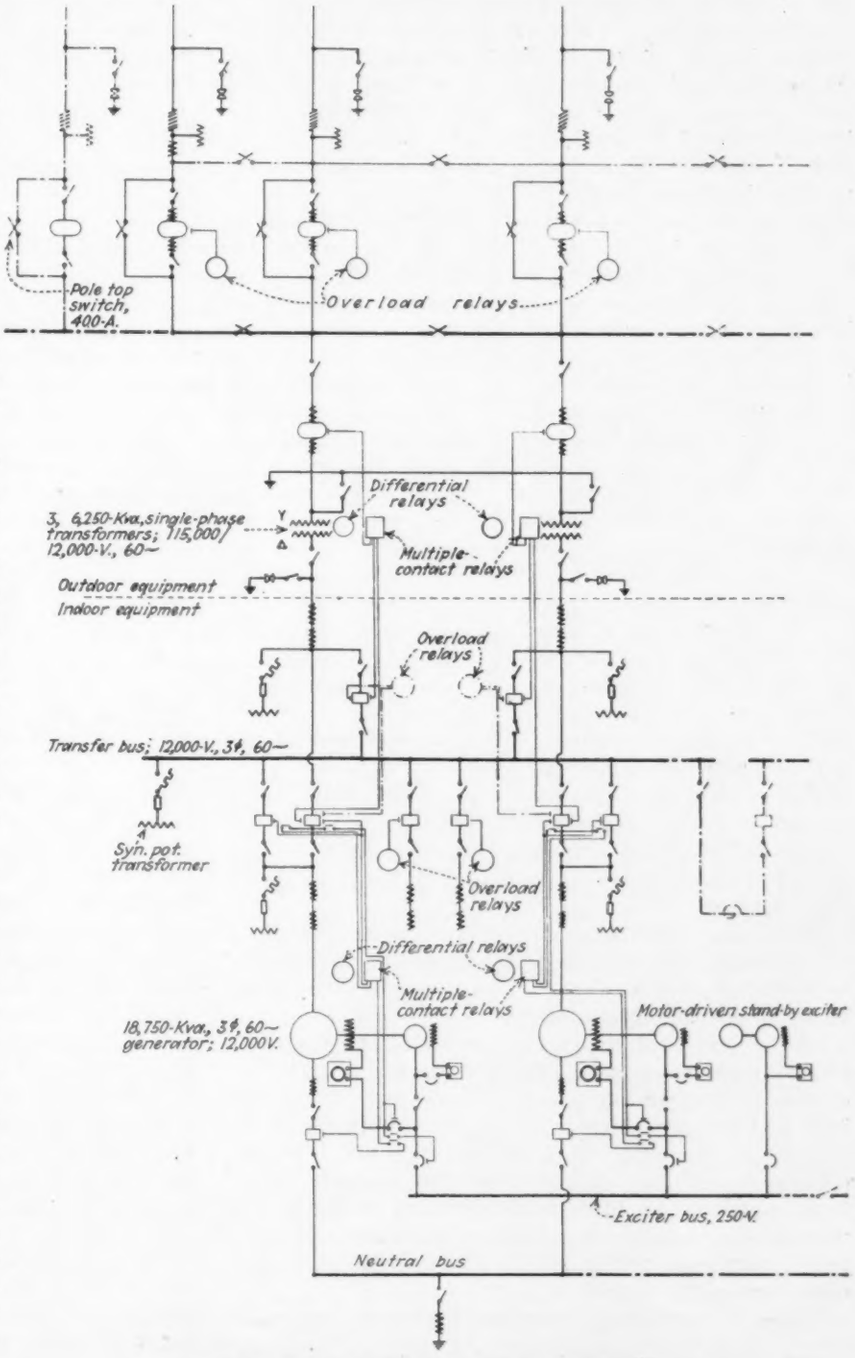
About 300 ft. from the generating station is the outdoor substation, which consists of an open steel structure of three bays (each 44 ft. wide, 105 ft. long and 66 ft. high) containing the power transformers, the oil circuit breakers, lightning arresters and instrument transformers. To fit the topography of the site the substructure is built on three terraces. The power transformers are located on the lower terrace, the circuit breakers on the intermediate terrace and the lightning arresters on the upper terrace of the station.

Each 12,000-volt power circuit is connected directly to a bank of three single-phase transformers (Y connected), which step the voltage up to 110 kv. One spare transformer is kept available on a truck on the transfer track of the substation. The 110-kv. circuits pass through oil breakers to a single bus. To this bus are connected three 110-kv. lines through oil circuit breakers shunted by pole top switches.

Construction of the camp and railroad started the latter part of May, 1924. Cofferdam construction started in August of the same year and the first concrete was placed in the dam in February, 1925. This development was designed and constructed by Stone & Webster, Inc.




KILOWATT-HOUR DRAWDOWN CURVES OF BARTLETT'S FERRY RESERVOIR




FEATURES OF ELECTRICAL SWITCHING ARRANGEMENTS

# Demand Costs and Their Allocation

## Methods of Allocating Fixed Charges Discussed on a Comparative Basis—Fallacies and Limitations Outlined—Advantages of Fixed Charge Allocations in Utility Business—New Method Proposed

By H. W. HILLS*
*The Philadelphia Electric Company*

AS THE central-station companies extend their service to all classes of use, from residential to commercial and from industrial to rural, the subject of correct allocation of costs assumes increasingly greater importance. Except in rare cases it is undesirable to develop an unprofitable load, and on the other hand a profitable load that is not developed is an economic waste, for if it were combined with the other loads of the power company, less equipment with greater possibilities for continuity of good service would result; and not only does the new customer benefit directly by these accrued advantages, but the old customers also reap their portion of the saving due to increased efficiency of operations and decreased investment required to serve them. The central station also benefits directly in many ways by proper load development:

1. It increases the revenue and hence the profits.

2. It results in making possible lower rates for the customers due to this increased efficiency of operation, and this exercises a powerful influence in molding public opinion, which must be favorable in order for the prosperity of the company to continue.

3. It stabilizes the company's business by providing increased diversification of use, and this is a much-desired result.

Still other advantages may accrue to the benefit of the company, but any one of the foregoing is sufficient to induce the company to exert all its efforts in developing all possible profitable loads.

One of the most difficult problems in the operation of a company generating, transmitting and distributing electricity to diversified groups of consumers always has been and still continues to be the determination of the true cost of service to each consumer or group of consumers. Without a true knowledge of correct costs it is impossible to differentiate between profitable and unprofitable business; it is impossible to adopt the correct commercial policy and it is impossible to have correct rates for service.

The public service commissions of the various states are continually holding rate hearings and receiving requests for changes in rates, and very often the burden is thrust upon the power company to justify its rates by a reasonable allocation of costs. So that accurate records of costs can be obtained when desired, commissions have in almost all cases insisted upon certain definite accounting methods and procedure. Many electric light companies do more than is required by the commissions, and for their own benefit they make continually, from time to time, a more or less complete allocation of costs among their different rate schedules. And it may safely be stated that in the future the most prosperous companies will be those which, by the adoption of the most reasonable methods, derive fairly accurate data upon which they can build a fairly correct commercial policy and system of charging.

**THERE has been considerable discussion of demand cost allocations in the electrical industry. This article by H. W. Hills reviews the elements of the several methods proposed or in use, and in addition the author advocates a new method that has many favorable features. Although the author applies his theory to systems having fairly fixed peak loads, the principles can be applied with slight modification to a system that has no distinct peak. This paper was awarded the Doherty prize by the N.E.L.A. in 1926 and is considered so admirable a review of the subject and so original in conception of a new method of cost allocation that it is presented to our readers.—*Editor.***

No paper on a subject of this nature would be complete without reference to the work of Dr. John Hopkinson concerning this matter. He can rightfully be called the father of modern central-station cost analysis and rate theory. His division of costs with their relative charges into two classes, fixed and variable, has received the general approbation of and adoption by the electric light and power industry. He strongly maintained that fixed costs include more than fixed capital costs, for it was his contention that the plant alone was not sufficient to serve a customer at the desired time with the amount of energy demanded. Accordingly he included in fixed charges an allocated portion of labor, fuel, oil, supplies and miscellaneous expense necessary to maintain the plant and equipment running at no load in order just to be ready to supply the current when wanted.

This sounds very plausible. But when it comes to practical application of the theory, where are we to draw the line? We can arbitrarily pick a certain percentage of operating costs and say they are fixed, but is this correct? Actually many of the operating costs are fairly constant. As far as labor is concerned, the men must be of sufficient numbers and they must be capable not only of operating the plant at no load but, more than that, they must be able properly to take care of the peak load condition. Skilled operators, mechanics

*This paper was granted the Henry L. Doherty prize by the N.E.L.A. prize award committee in 1926.

and supervisors cannot be trained over night, nor can they be laid off during that portion of the year when the station load is lowest.

So, if we are to include a portion of operating expenses in the demand, or readiness-to-serve, charge, which the customer must pay whether he uses electricity or not, it is certainly incorrect to use the hypothetical condition of no-load operation as a basis for computing this portion of the charge. That this is the fact may be readily appreciated by considering the effect upon the company if a small force only large enough to operate a plant at no load were employed. Either one of two results would occur. This force might be of the same size as the plant required at full-load operation, in which case the cost would be fixed for all conditions, and hence no percentage could justly be used for no-load operation. Or in case this force for no-load operation were insufficient for supplying the peak demand, the result would be the same as though the equipment were inadequate, for the peak would not be supplied. So we see that the fixed operating expenses to be included in the demand charge have nothing to do with the no-load operation of the plant, as far as operating labor is concerned, but depends entirely upon the peak.

But how about the allocation of the variable expenses, such as fuel and oil, to this demand charge? Obviously we cannot take the peak-load consumption of fuel and oil as a basis of additional fixed cost, for this is purely a variable and depends solely on the duration of the peak. Analyses of the amounts of fuel and oil consumed in generating stations show that we may divide the consumption into two parts; one part very nearly proportional to the station output over the operating range of the units, and a second part which depends upon the number and size of the individual boilers and machines operated and the length of time. This second part is due to the constant losses in the boilers and generators and is independent of the kilowatt-hours generated, but it is practically proportional to the capacity required to supply the daily peak load. Hence, there is a certain percentage of fuel and oil cost which must be allocated as a demand cost.

### Depreciation Is a Fixed Cost

Depreciation costs on the equipment and buildings are for the most part fixed costs. It matters little how much load is put upon the plant; the actual annual depreciation that results from wear and tear due to generating kilowatt-hours is a negligible factor if we adequately maintain the equipment and include these costs under maintenance. It may be difficult to draw the line between depreciation and maintenance in some cases, but usually depreciation is merely an accounting procedure of accumulating the cost of a plant from revenue during the useful life of that plant. In the case of buildings, this depreciation is independent of the load on the machinery. In the case of the machinery, the additional wear and tear due to generating kilowatt-hours affects only certain parts that can be renewed from time to time, and thus with the proper maintenance, this depreciation item is constant. The only real factor in the depreciation of electrical apparatus, including turbines, generators, transformers, switching equipment, bus structure and operating switchboard, is obsolescence, and this is absolutely independent of the kilowatt-hours generated. So we may consider all real depreciation costs as fixed.

Now as to the costs of maintaining the plant so that service may be given when the demand occurs. Can this justly be divided between fixed and variable items? There are costs due to the maintenance of boiler plant, turbine plant, electric plant, coal storage plant, etc., which are distinctly capacity costs necessitated by the size of the plant and the peak load supplied and not dependent upon the kilowatt-hours generated. The electric equipment comes entirely in this class, for the kilowatt-hours generated do not cause any appreciable increased maintenance cost. On the other hand, other equipment, such as the boiler and coal storage plant, has a decided increase in maintenance cost with increased kilowatt-hour output. Studies of the individual systems can alone determine the percentages of the maintenance expenses to be allocated as demand and as energy costs.

The amount of repairs and maintenance to buildings and structures is not a variable cost due to load conditions, but this cost is substantially the same whether

FIG. 1—STATION PEAK CAUSED BY COINCIDENT DEMANDS OF CUSTOMERS

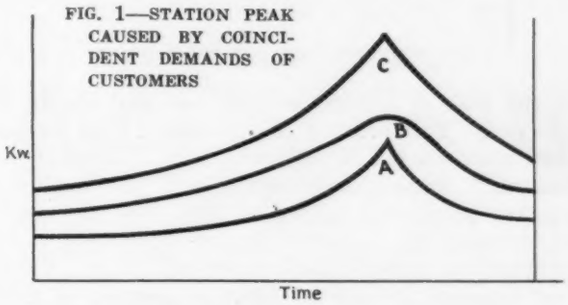
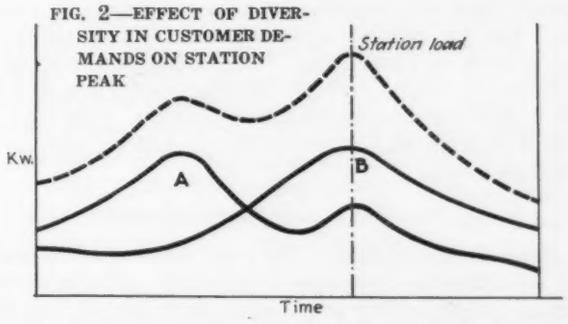



FIG. 2—EFFECT OF DIVERSITY IN CUSTOMER DEMANDS ON STATION PEAK




the plant is operated at full load or not at all. Therefore, this portion of the maintenance expense is in a sense fixed, and should be included in the demand costs of service. It is also true that repairs to buildings and structures are not usually absolutely necessary at certain specific times, and so it is common practice among industrial organizations to make such repairs, or at any rate to raise the money for such repairs, during periods of prosperity. Likewise with the central station, there is no real reason why a customer should be forced to pay for maintenance of buildings and structures during periods of business depression, at times when his kilowatt-hour consumption is low. Nevertheless, this latter consideration should bear no weight in a rigorous determination of cost, for the problem of charging is one which has to be met by different commercial, political and economic considerations.

It is common operating practice to overhaul, clean and repair most of the equipment during the off-peak time of year. Consequently the sum total of the kilowatt capacity of all the generating equipment is considerably less than that which would be required if the plant were operated at 100 per cent load factor through-

out the entire year, delivering the peak load. Since some of the equipment used during the period of the annual peak load is needed anyway to replace equipment during repairs and overhauling, it is questionable just how much of this capacity should be allocated to the customers who are on the system at that time.

As a summation, it may be said that the demand charge should be sufficient to cover all expenses in getting ready and being prepared to supply the peak load for a reasonable length of time, a half-hour being a fair and usual duration. Any cost due to the duration

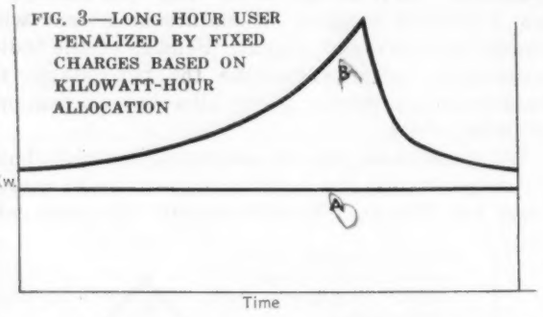



FIG. 3—LONG HOUR USER PENALIZED BY FIXED CHARGES BASED ON KILOWATT-HOUR ALLOCATION

of the peak is a kilowatt-hour cost and should be so allocated. This demand charge should then include all fixed costs on the investment, such as interest, taxes, insurance, annual depreciation and amortization and also the permanent operating force with the overhead supervision, etc., necessary to operate but not maintain the plant at all-peak load for one-half hour. The variable expenses include an allocated portion of maintenance, fuel, oil, supplies, surplus, commercial expense incurred in getting new business and miscellaneous items such as advertising. The commercial expense incidental to taking care of existing customers, together with metering, meter reading, billing, collecting and other distinct customers' costs, should be allocated as customer costs.

## ALLOCATION OF FIXED CHARGES

*Peak Responsibility.*—The peak responsibility method of allocating fixed charges is gradually gaining disfavor among public utility engineers. It is one of the oldest methods in practice, and much can be said in its favor. At least it is an attempt to place the burden upon those classes of service responsible for the large amount of investment the central station is required to make. But it must be clearly understood to exactly what particular cases this method is applicable. If we have a company serving groups of customers whose peaks are coincident in forming the annual peak on the company's system, the peak responsibility method is fair and just. In the early days of the light and power industry, when light was by far the largest part of the load served, this condition existed. At that time any load of an off-peak nature which could be developed yielded profit if it paid more than the additional expenses incurred in generating and distributing this off-peak current. But conditions have changed.

Today the central station is called upon for service by industries of all kinds in addition to residential, commercial, street-lighting and railway purposes. Consequently we have daily peaks at one time of year due to the overlapping of high demands of some of the customers, whereas at another time of the year the peak may be due to the high demands of an entirely different set of customers.

Plant equipment is just as necessary to serve one group of customers as another, and it is obviously grossly unfair to charge one group of customers who happen to use current at the time of the annual peak with all of the fixed charges and let the other customers use the equipment for nothing. This is not only unfair but it is impracticable, for often a peak due to one group of customers will be the annual peak and in the following year it will be caused by a different group. It is impossible to adjust rates from year to year, throwing the entire burden of fixed costs back and forth among two or more different groups of customers, and the allocation of expenses that would make this necessary must be in error.

This error is due to the fallacy in the theory that those customers who cause the annual peak are solely responsible for the necessity of having all the equipment required to serve them at that time. This is true in only those cases where there are no other customers. But off-peak customers require equipment to serve them as well as the on-peak customers, and regardless of the time of day or year that service is demanded by an off-peak customer, sufficient plant capacity must be available for him at that time. Then it is not just that another customer or group of customers should pay for all the fixed expenses of the equipment necessary to serve him.

## UNFAIR DIVISIONS OF PEAK-LOAD CHARGES

In Fig. 1 we have a station peak caused by the coincident maximum demands of the customers served. In this case the equipment necessary to serve each individual customer should be chargeable to that customer and the peak responsibility method is accurate and fair.

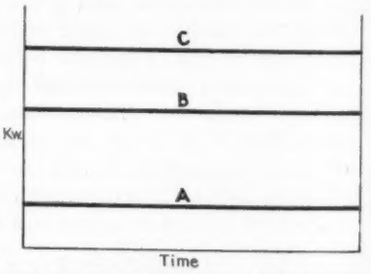



FIG. 4—KILOWATT-HOUR ALLOCATION OF FIXED CHARGES IS EQUITABLE FOR 100 PER CENT LOAD FACTOR BUSINESS

In Fig. 2 we have two customers, A and B, each of which has the same maximum demand. Each consumes the same number of kilowatt-hours. But their load curves are such that the station peak occurs at the time of the maximum demand of customer B, and therefore according to the peak responsibility theory, B would pay on a demand equal to 100 per cent of his individual maximum, whereas A would pay on but a small fraction. And yet A is, in a sense, responsible for the peak, for if he used only as much demand as B did during A's maximum, the two peaks would be the same. Under the peak responsibility method, either customer could throw the larger part of fixed costs onto the other by wasting current during the other customer's peak so as to make the station peak occur at that time. The injustice of this method is plain.

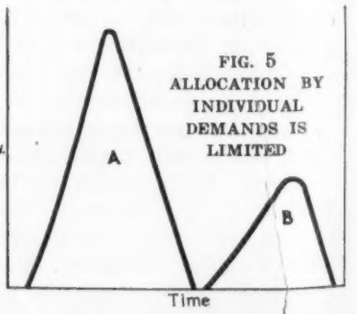



FIG. 5 ALLOCATION BY INDIVIDUAL DEMANDS IS LIMITED

If we divide the annual fixed charges by the number of kilowatt-hours generated and allocate these costs ac-

cordingly among all the customers served, we obviously penalize the long hour user.

In Fig. 3, for example, A has a 20,000-kw. peak, but has only a 10 per cent load factor. B has a 100 per cent load factor with a demand of 10,000 kw. On a kilowatt-hour basis, A would then pay only one-sixth of the total demand charges, whereas he should pay two-thirds. B would pay five-sixths, but all he could rightfully be charged for is one-third, for that is all that he uses.

The fallacy in this method is perfectly evident, but there is an element of fairness back of this theory. And that is that a kilowatt-hour requires plant capacity of 1 kw. for a period of one hour for its generation. The fixed cost necessary to generate a kilowatt-hour should, therefore, be included in the cost of its generation.

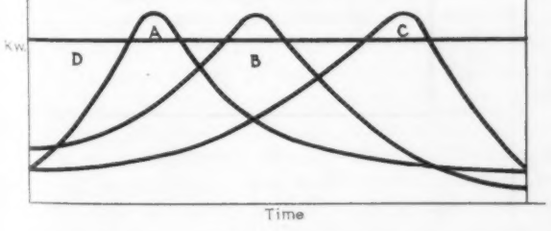
So in Fig. 4, with 100 per cent load factor customers, this method of allocation is perfectly fair to all customers. But of course this condition seldom exists in practice.

### Using Kilowatt-Demand as a Basis

So impressive have the errors in the peak responsibility method become that today many engineers are advocating the allocation of fixed costs according to the individual maximum demands. Thus we add together the individual peaks of all the customers and divide the customer's individual peak by the sum obtained. The resulting percentage multiplied by the total fixed costs determines the allocated portion for that customer. This method gives correct results only in certain isolated cases. In Fig. 1, where the customers' peaks coincide, this method agrees with peak responsibility. Or if we have a case similar to Fig. 5, where the maximum demands occur at different times and there is no overlapping of curves and the load factors of all customers are the same, this method is applicable and the results are fair and just.

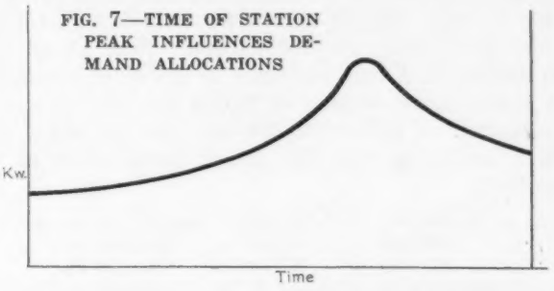
But there are two considerations of first degree importance that are neglected in this method. First, it neglects the important item of time that the peak occurs. And there is no gainsaying the fact that it costs considerably more to serve a customer who comes on at the time of the station peak than though he did not come on except at an off-peak period. If all customers are to receive their rightful benefits that accrue from the diversity of use, this element of time of their peak is of utmost importance. In the second place, this method entirely neglects hours use of the equipment, and kilowatt-hours cannot be generated without monopolizing certain capacity for certain lengths of time.

FIG. 6—INDIVIDUAL DEMAND BASIS OF ALLOCATION IGNORES TIME OF PEAK AND HOURS USE OF DEMAND




In Fig. 6 we have four groups of customers with a maximum total peak on the station of 30,000 kw. The sum of the individual maximum demands equals 50,000 kw. Customer D has 100 per cent load factor with a demand of 10,000 kw. According to this method of allocation of fixed charges, he would pay for only 20 per cent of the 30,000 kw. capacity, or for 6,000 kw., whereas he should pay for 10,000. Likewise, with all customers whose load factor is above the average, a portion of their just share of fixed expense is allocated to those customers whose load factor is below the average. Of course, it may be pointed out that this will encourage long hours use of the individual demand, but that does not justify serving long hour users below cost.

FIG. 7—TIME OF STATION PEAK INFLUENCES DEMAND ALLOCATIONS




This method of allocating fixed charges according to the individual maximum demands not only disregards the very important item of demand at the time of the station peak but it neglects entirely the hours use of the company's capacity. After all, a demand or readiness-to-serve charge is nothing more or less than a rental charge to cover those fixed expenses incurred because the electric company must have available sufficient generating, transmission, substation or distribution capacity adequate to serve the customer when he wants to be served. If the customer does not wish to be served often, then this equipment is used for other customers, and the amount of station capacity available for the use of other customers depends upon the hours use by that customer. Consequently it is unfair to charge the same fixed costs per kilowatt demand to all customers, regardless of their hours use.

### Greene's Method

In the ELECTRICAL WORLD of Nov. 7, 1925, page 947, W. J. Greene, in his article entitled "Determining Demand Charge," develops two equations so that both the customer's demand and kilowatt-hour consumption are taken into account. The equations are:

$$KX + DY = C$$

$$8{,}760X + Y = C \div P$$

where $X$ = cost per kilowatt-hour of that portion of the capacity costs that function with the kilowatt-hours supplied the consumer.

$Y$ = demand cost per kilowatt of that portion of the capacity costs that function with consumer's maximum demand.

$D$ = sum of consumer's maximum demands.

$P$ = maximum coincident demand of all consumers.

$K$ = kilowatt-hours used by all consumers in year.

$C$ = total annual fixed charges.

8,760 = number of hours in one year.

It is evident that this method is but a combination of the two previous methods just discussed—namely, allocating fixed charges according to kilowatt-hours in one case and according to individual maximum demands in the other. Accordingly this combination eliminates some of the errors of each separate method. It does charge the 100 per cent load factor customer his true

share of expense, but so does the peak responsibility method do this. It does allocate to the off-peak customer some portion of the fixed charges, which the peak responsibility method does not accomplish. So without any doubt it is a fairer method than any of those just discussed. But it neglects one very important item, and this is the time at which the individual maximum demands occur.

In Fig. 7 we have a station peak of 100,000 kw. with more than 50,000 kw. idle except during the hours from 4 to 7 p.m. The sum of the individual maximum demands is, let us say, 200,000 kw. The total kilowatt-hours consumed per year are 360,000,000. Now let us consider taking on a new customer or group of customers with a maximum demand of 20,000 kw. and an annual consumption of 80,000,000 kw.-hr. Let us apply this method, assuming that the annual peaks occur at the same time.

$$
\begin{aligned}
K &= 360{,}000{,}000 + 80{,}000{,}000 = 440{,}000{,}000 \text{ kw.-hr.} \\
P &= 100{,}000 + 20{,}000 = 120{,}000 \text{ kw.} \\
D &= 200{,}000 + 20{,}000 = 220{,}000 \text{ kw.} \\
C &= \$60.00 \times P = \$7{,}200{,}000 \\
440{,}000{,}000X &+ 220{,}000Y = \$7{,}200{,}000 \\
8{,}760X &- Y = \$60 \\
X &= \$0.004 \\
Y &= \$24.96
\end{aligned}
$$

So the customer would pay a demand charge of approximately $820,000, or $41 per kilowatt per year. (80,000,000 × $0.004 + 20,000 × $24.96 = $820,000.)

This result shows the obvious error in this method. This new customer or group of customers require additional plant capacity of 20,000 kw., with fixed charges of $60 per kilowatt, making a total increase in fixed cost of $1,200,000, and yet this method would allocate only about two-thirds of that sum to him. To the old customers would be allocated the difference. The fallacy in this method is evident—namely, the time at which the individual maximum demands occur cannot be neglected with fairness to all concerned.

A further point worth discussing is that of using kilowatt-hours consumed versus kilowatt-hours generated. If all customers have the same percentage kilowatt-hour loss between the generating plant and the consumers' meters, it is all right to use either, but if these percentages are not the same, the kilowatt-hours generated for each consumer or class of consumers should be used, for it is the demand at the generating plant, not the consumption at the customers' premises, and it is unfair to allocate to one group of customers who have a small percentage transmission and distribution loss any portion of the fixed generating or other fixed charges due to those customers with a high percentage loss.

### THE EISENMENGER THEORY

In his book entitled "Central-Station Rates in Theory and Practice" H. E. Eisenmenger shows the inherent fallacies in the peak responsibility method and discusses various considerations that should be taken into account in determining a correct allocation of demand costs. Accordingly he has modified the peak responsibility method by a fairly comprehensive procedure so that to those customers who are on at the time of the station peak are allocated fixed charges to cover those peak costs, whereas to off-peak users are allocated certain fixed costs due to their hours use of plant capacity. Because it takes into account the important factor of time as regards the individual maximum demand and also the length of time the capacity is used, as well as the amount, it is more nearly accurate than any of the methods just discussed.

In Fig. 8 we have two customers, A and B, as shown, A using 100,000 kw. for four hours and B using 50,000 kw. for the remaining twenty hours in the day. Assume we have the same conditions each day in the year. Applying the Eisenmenger theory: To A would be allocated 100,000 minus 50,000, or 50,000, due to the station peak, plus four twenty-fourths, or one-sixth, of the remaining 50,000 kw., due to his hours use of that

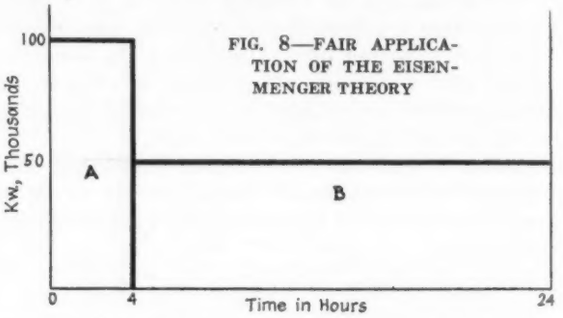



FIG. 8—FAIR APPLICATION OF THE EISENMENGER THEORY

capacity. His fixed charge would then be based upon 58,333 kw. To B would be allocated twenty twenty-fourths, or five-sixths, of the remaining 50,000 kw., due to his hours use of that capacity. B's fixed charge would then be based upon 41,667 kw. As far as this example goes, this method is flawless. For this case these results are fair and just, and none of the preceding methods will give these results.

But let us consider another example where the customers, instead of having their load at entirely different times, use their load at the same time. Customers A and B, in Fig. 9, each has a demand of 50,000 kw. A uses his demand four hours per day, whereas B has 100 per cent load factor. Applying the Eisenmenger theory: To Customer A would be allocated 50,000 multiplied by 50,000 divided by 100,000, or 25,000, due to the station peak, plus 25,000 multiplied by four twenty-fourths, or one-sixth, for this hours use of the remaining plant capacity. His fixed charge would then be based upon 29,167 kw. To B would be allocated 50,000 multiplied by 50,000 divided by 100,000, or 25,000 kw., due to the

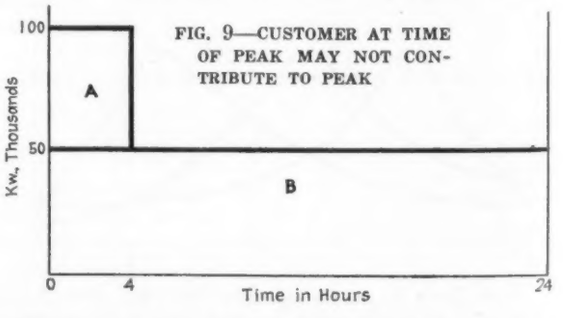



FIG. 9—CUSTOMER AT TIME OF PEAK MAY NOT CONTRIBUTE TO PEAK

station peak plus an amount for hours use of plant capacity equal to 25,000 for four hours and 50,000 for twenty hours. B's fixed charge would then be based upon 70,833 kw., and yet his maximum demand is only 50,000 kw. Obviously the theory is in error in this case.

So we can conclude that for off-peak customers the Eisenmenger theory gives correct results, but it does not divide the fixed charges correctly among those customers who are on at the time of the station peak. And the fallacy in the whole theory lies in the determination

of the responsibility for the station peak. It is Eisenmenger's contention that every customer who is on at the time of the station peak contributes to that peak. But this is not so. In the above case, Fig. 9, Customer B does not cause any peak, for he has none, and any station peak that occurs is due entirely to influences over which he has no control. He monopolized 50,000 kw. of plant capacity all the time, and that is what should be charged against him, no more and no less. Of course, if he should refrain from using the plant for a certain number of hours each day so that some other customer could use the plant at that time, other factors than only the consideration of his hours use of plant capacity would enter into the problem and then the correct charge could be determined only by commercial considerations. But it should be quite obvious that any method of allocation of costs is in error where it charges customers upon more capacity than they ever use.

In a second article a practical method for allocating fixed costs to all customers will be presented which considers the elements heretofore discussed and which seems to be at the same time simple, fair and practical in application.

# Letters from Our Readers

### How Portland, Ore., Guards Against Unsafe Appliances

*To the Editor of the* ELECTRICAL WORLD:

I have read with interest the editorial appearing in the Nov. 13 issue of the ELECTRICAL WORLD entitled "Why Not an Electrical Appliance Laboratory?" From this editorial I gather that some of the larger manufacturers of electrical appliances have exerted considerable influence toward maintaining the quality of their products at a high level. It has been suggested that central-station companies adopt the practice of testing out appliances and approving them before they are offered to the public, inasmuch as poorly constructed electrical appliances lead to numerous service calls and are a source of dissatisfaction to the user.

It might be of interest to you to know that in the city of Portland we have for the past four years operated under a stock inspection law which provides for the licensing of all merchants who sell electrical appliances intended for attachment on light and power circuits. We have found this to be the most effective way of curtailing the use of sub-standard and unsafe electrical devices, as it is obviously much easier to control the sale of unapproved devices than to attempt to stop the use of appliances which have been purchased in good faith by persons not electrically trained and consequently not able to determine for themselves the requirements for safe electrical materials and appliances.

In the Portland electrical ordinance, Sections 301(a), item 4, 701(b) and 702(a) and (b), the approval of the Underwriters' Laboratories is recognized. This has been done instead of setting up standards of our own and attempting to test appliances without having the necessary laboratory facilities. Should the National Electric Light Association establish a national laboratory for the purpose of examining electrical appliances, the city of Portland would promptly amend its electrical ordinance to recognize the approval of such a laboratory, inasmuch as it would undoubtedly be an organization of national standing.

In your editorial you bring out the fact that cheap and poorly constructed appliances are a source of trouble to the central-station companies and a source of dissatisfaction to the user, but you fail to emphasize a still more important objection to the use of unsafe appliances, namely, the increased fire hazard through their use on light and power circuits. Right here is an opportunity long overlooked of enlisting the aid of the state and municipal governments throughout the nation in the elimination of cheap sub-standard electrical equipment. Virtually every electrical code throughout the country contains a provision requiring the use of only such materials and appliances as have been tested and approved by the Underwriters' Laboratories or by some other similar organization of recognized standing. Why not also incorporate in the various codes a section prohibiting the sale of unsafe, unapproved appliances? Is this not a more logical way of controlling the situation? It has proved very effective in the city of Portland for the past four years, but it would be much more effective if other large cities would take a similar stand so that the market for unapproved appliances would be curtailed to such an extent that manufacturers generally would gladly maintain the quality of their products at the minimum standard required by the Underwriters' Laboratories or other institutions of similar standing.

Your editorial suggests a new and valuable idea and one which if acted upon would prove a real benefit not only to the electrical industry but as well to the general public, who in the end are the ones to suffer from the distribution of cheap, unsafe electrical materials.

L. W. GOING,
Chief Electrical Inspector.

Commission of Public Works,
Portland, Ore.

### Laying Conduit by the Built-Up Method

*To the Editor of the* ELECTRICAL WORLD:

Permit me to make a few suggestions concerning the article by J. M. Gillham, entitled "Conduit Laid by Built-Up Method," in your issue of Dec. 11 (page 1224). The use of a moving mixer necessitates conditions that are rarely met in practice. Where a duct line is constructed in advance of paving, between curb and sidewalk, or in a boulevard containing a large number of trees and shrubs, or in a congested alley, its use would be rather cumbersome; also, it would appear to the writer that the provision of a water supply for the mixer would necessitate an extremely long hose in many cases.

One objection to the pouring of all the concrete after all the ducts are laid is that many of the pipe sections will not be completely incased in concrete. To make sure that all the interstices between the sections be filled it would be necessary to use a wet mixture and a fine aggregate, which in turn would tend to float the ducts, thus throwing them out of line and grade. The use of jacks sufficiently long to span the trench is also advocated, these being much more steady in heavy ground and safer to use than those shown. If the spacers are hollowed out over the duct line underneath and under the line immediately above, it aids in keeping the ducts in line and also does away with the necessity of bracing the ducts against the side of the trench, which is not always exactly even in width.

Detroit, Mich. E. H. BRONSON.

# Central Station and Industrial Practice

## Closed-Top Batteries for Low-Duty Control Circuits

MANY central stations have, and have had for many years, large storage batteries floating on their direct-current systems for short-time emergency service or taking the bothersome tips off the peaks of the station loads. For such major-battery installations no arrangement of parts other than the classic open-top sheet lead-lined wooden tank with the plates suspended from glass plates on edge is usually considered either economical or desirable. As a result there has grown up a tra-

TYPICAL CLOSED-TOP CONTROL BATTERY INSTALLATION OF COMMONWEALTH EDISON COMPANY

dition or tendency to use only open-type storage batteries for other purposes where their use is not always logical nor defensible.

For example, ordinary control equipment and automatic and semi-automatic operations in modern substations make large use of auxiliary current supplied from storage batteries. Such applications draw comparatively small currents and in some cases the draft on the battery is infrequent. Under these conditions the open-top battery is not necessarily the most desirable, in spite of a precedent of years, and the closed type can be economically used. The only argument against the closed-type battery is the danger of explosion, which is much feared but seldom experienced.

According to E. F. Bracken, superintendent of maintenance division, Commonwealth Edison Company, Chicago, this company has about 280 control batteries on its system. The capacities range from 120 to 250 amp.-hr. at the one-hour discharge rate. Approximately a quarter of these batteries are rated at 115 volts and the remainder at 30. All of the lower-voltage batteries have acid-tight spray-proof covers. and a large part of the others are so equipped. One of the principal installations of open-top batteries is in a substation supplying energy to the electrified Illinois Central suburban lines. The reason for this type is that closed-top batteries were not available in the large-unit size (250 amp.) desired. The only explosion of a closed-top battery in Mr. Bracken's experience occurred when a man undertook to burn a terminal off with a gasoline torch while the battery was under charge and gassing freely.

A thing to be desired in the closed-top type of battery, according to one school of thought, is a transparent container so that visual inspection may reveal buckled and warped plate conditions. Protagonists of the opaque container contend that visual inspection through a transparent container will not reveal a sulphated surface and that the usual spacers prevent buckling and warping from causing internal short circuits. The lower cost of the opaque containers is a powerful argument for their use.

## $CO_2$ Protection Used in Transformer Vaults

BY T. J. KAUFFELD
Engineer Walter Kidde & Company, Inc., New York

PROTECTION is afforded four large transformer vaults in the Mauerstrasse substation of the Berlin Stadtische Elektrizitäts Werk Allgemeine Gesellschaft by the use of a carbon dioxide fire-extinguishing system. Each of the vaults contains one oil-cooled transformer and has a volume of about 6,400 cu.ft. Located in the ceiling of the vault and leading upward to a chimney on the roof is a ventilating duct of approximately 25 sq.ft. cross-section. At a point in the duct corresponding to about the third floor of the building is located a steel damper of the butterfly type, but pivoted off center.

A supply of liquid carbon dioxide is contained in eight 66-lb. cylinders, manifolded together and held rigidly in place by oak racks and a steel frame, all of which are mounted on a scale and equipped with a "loss-in-weight" alarm. A flexible high-pressure copper pipe leads from the cylinder manifold to a wrought-iron pipe line entering the vault above through the floor. From this point two branches run around the inside walls horizontally about half of the transformer height above the floor, with special nozzles in each corner pointing obliquely downward upon the transformers. Leading from these two branches are three smaller lines which rise vertically about a foot from the top of the transformer. Tapping the ends are nozzles which point downward so as to "rake" the top of the transformer with the gas. Basically, this system (Lux) of fire extinguishing consists of the use of four independent batteries of carbon

dioxide cylinders, each battery to protect an individual vault.

Each carbon dioxide cylinder is equipped with a shell having as a part of its body a thin metallic disk that holds back the pressure. Facing this disk and attached to the valve body is a small compact cutter mechanism fitted with a lever. When the lever revolves, a tubular cutter is projected through the disk by a quick-advance thread and the liquid carbon dioxide is released into the manifold and conveyed to the vault. Ordinarily these levers are held from revolving by electric releases actuated from push buttons in break-glass control boxes located on a wall in the vicinity of the vaults. A similar release also controls the operation of the air-duct damper, normally held open.

Emptying of the containers is checked by the ringing of the "loss-in-weight" alarm. Fire at all levels in the vault space can be extinguished in 30 seconds.

## A Peculiar Misuse of Rope Tackle Blocks

CHANGES were being made in the location of certain semi-strain towers on a 132,000-volt transmission line of a Middle Western utility when the foreman was requested to turn the line over to the operating department immediately. The order was so urgent that instead of taking time to secure one of the conductors in the suspension clamps at the end of the insulator string the foreman left the conductor supported by a set of blocks with ½-in. rope in tension between the conductor and the insulator string. He intended that the blocks should be removed and permanent suspension made the next day.

Circumstances caused the rope to be left in this position for about 85 hours. Most of this time it rained, keeping the rope soaked, but as soon as it cleared up and the rope dried out, it was burned in two by the charging current of the insulator string. The conductor sagged to the ground, causing it to draw a heavy arc on a steel rail of a railroad running parallel with the line. Section men on the railroad might have been killed, but received only minor shocks.

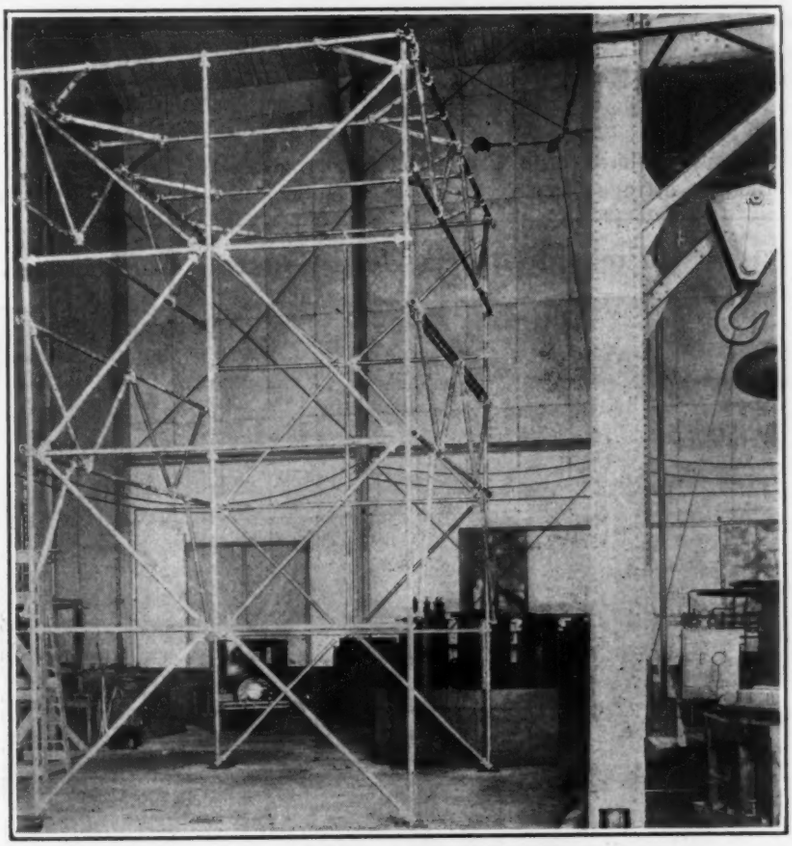
The average line foreman and many engineers would not think of the rope in this position as having to carry current, and probably if the line voltage had been only 33,000 or less the rope would not have been damaged.

This peculiar misuse of rope blocks was reported recently by the Bureau of Safety, which is the general supervisory organization for safety work in the group of utilities operated by Samuel Insull and associates.

## Strength Displayed by Pipe Structure

BY D. A. PICKERING
Westinghouse Electric & Manufacturing Company

TESTS to determine the performance of a pipe-structure assembly suitable for use in outdoor switching and substation construction have recently been completed in the high-voltage laboratory of the Westinghouse Electric & Manufacturing Company, located at Trafford City, Pa. The framework as erected for testing purposes was 25 ft. high, 18 ft. wide and 12 ft. 10½ in. deep.



PIPE STRUCTURE AS ERECTED IN LABORATORY AND IN READINESS FOR ITS TEST

A single pull was first imposed upon this structure by means of a traveling crane, the tension being gradually increased up to the rated capacity of the pipe framework, 3,000 lb. Even with this excessive loading concentrated at the central point, only slight distortion was noted.

Two diagonal braces to carry the strain directly from the central point of application to the two rear legs were added. A second application of the load was made up to 3,000 lb. and it was found that all distortion of the top had ceased. A plumb-bob showed a maximum of ⅜ in. deflection with a load on the frame and a return of ⅛ in., leaving a permanent set of ⅛ in. in the structure. The load was alternately put on and removed up to the 3,000 lb. limit several times, and then, as no signs of distress appeared, the 5,000 lb. maximum allowable tension of the dynamometer was applied. No further deflection was noted than the ⅜ in. and the permanent set of ⅛ in. was not increased.

The only member of the structure that showed any distortion at all was the top half of the right-hand rear leg, facing the structure from the front, and theoretically this leg would not have had any load in it at all had the bracing on the top been sufficient to withstand the 5,000-lb.

strain. The distortion of the top half of the rear leg is entirely attributed to the two diagonals that were placed on the top after the first application of load. This distortion remained in the leg after all load was removed from the structure and could therefore be considered as a permanent set.

Two inexperienced wiremen erected the structure complete in four working days, the concrete foundation having been previously run in, 1 yd. of concrete under each of the two rear or tension legs and 1 ft. of concrete under each of the two front compression legs.

The test proved the structure as a whole to be exceedingly stiff against horizontal sway across the framework—that is, in a direction perpendicular to the pole. This stiffness was experienced with the application of the load on the frame, and as that was the normal condition of the structure, any sway it might have had previously could be ignored entirely, as the application of the load apparently removed all flexible connections which might have been attributed to the pipe fittings themselves.

## Non-Slip Life Line Used for Pole-Top Accidents

A LIFE LINE possessing marked advantage over those commonly in use in overhead-line construction has been devised by Erven Jewett, an employee of the Wisconsin Power & Light Company at Portage, Wis. The end of this line, as shown in the accompanying drawing, carries a ring to which is spliced a piece of rope about 2 ft. long terminating in a snaffle hook.

In case of a pole-top accident the rescuer, unless he is very expert in tying knots, is likely to lose valuable time in preparing to lower the injured man. With this line it is a simple matter to lower a man with a minimum of lost time. The line is thrown around the victim's body directly under the arms. A half hitch is taken and the end of the line is placed around one of the man's legs close up to the trunk and the hook snapped into the ring. There is thus both speed of action and the avoidance of the danger of slipping of knots that may have been insecurely tied.

NEWLY DEVISED LIFE LINE

## Cost of Enlarging Plant

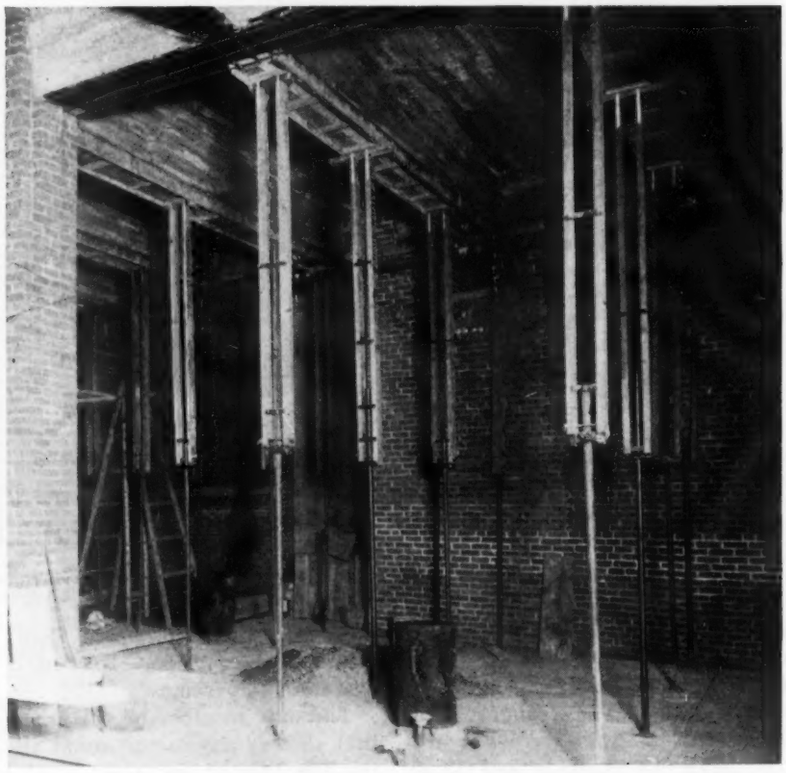
A NEW ENGLAND steam-driven central station has just added a 12,500-kw. turbo-generator and 200-kw. steam and motor-driven exciter to its equipment, the work also including the building of a 40x53-ft. two-bay extension of the turbine room, a complete new condenser with auxiliaries and piping, new circulating-water intake and discharge system, new feed-water system for the foregoing generating unit, and the installation of four new 13,200-volt feeders in a 20x20-ft. extension to the electrical bay. The main unit has been erected on a reinforced concrete support, the mat of which is about 19 ft. deep with concrete supports erected approximately 21 ft. high above the mat. In the new 13,200-volt bay are installed concrete bus and oil circuit breaker compartments. A new 2,300-volt bay contains concrete compartments for the generator, transformer and group-feeder switches and buses and also for twelve indoor-type reactors directly connected with the group feeders.

About 1,500 ft. of two-deck tunnel (cross-section 5x5 ft. each) for intake and discharge water was constructed, and approximately 120 ft. of open discharge flume with weir was built. The screen well and pump house consist of a concrete substructure about 80x30 ft. x 19 ft. high, with a concrete settling basin about 20x30 ft.

SELECTED CONTRACT TOTALS
(Installation costs not stated)

| | |
|---|---|
| Three 500-kva. induction regulators. | $11,298 |
| One 22,000-sq.ft. surface condenser and auxiliaries exclusive of tubes. | 59,070 |
| Three 2,000-kva. outdoor type transformers and accessories | 9,951 |
| One 35,000-c.f.m. air washer with pump, strainer, piping | 1,119 |
| One 12,500-kw. turbo-generator with oil coolers, etc. | 211,830 |
| Two motor-driven revolving water screens | 5,470 |
| Twelve single-phase current-limiting reactors, indoor type | 3,900 |
| Two 46-kva. induction feeder regulators | 2,477 |
| One 4-in. volute pump | 1,884 |
| One 750-g.p.m. water pump connected to steam turbine | 1,677 |
| Valve control equipment for two 24-in. water valves | 1,135 |
| 86,000 ft. of Muntz metal condenser tubes | 9,364 |
| One 46-kva., 200-amp. induction feeder regulator | 1,214 |
| Six 343-kva. reactors | 2,262 |

## Adjustable Braces Hold Concrete Forms



AT THE Cambridge Street substation of the Edison Electric Illuminating Company of Boston the use of adjustable vertical braces for holding horizontal concrete forms saved the time and labor in bracing forms and removing them. Furthermore, they did not obstruct passage through the station during construction, as the ordinary bracing would have done. The waste of lumber incurred after concrete forms are removed was also avoided.

Outside the building is a concrete mat 20x75 ft. with fence inclosure to care for three transformer banks aggregating 12,000 kw. Six outdoor reactors are also located within this inclosure. Ties from the transformer banks to the station buses are run through underground duct lines, other ducts being run from the new unit, outdoors, and into the 13,200-volt bay. Various yard improvements included the relocation of a coal trestle, for which new concrete bents had to be placed, and the construction, at a cost of nearly $5,000, of an abutment and retaining wall.

The cost of this work, 98 per cent completed and 2 per cent estimated, is presented in the accompanying tables.

COST OF INSTALLING ONE 12,500-KW. TURBO-GENERATOR AND COLLATERAL NEW CONSTRUCTION

| | Cost (Cents Omitted) |
|---|---|
| **Land:** | |
| Station yard: | |
| Grading | $6,825 |
| **Structures:** | |
| Station yard: | |
| Fence relocation, including three new gates | 1,919 |
| Yard track and changes | 7,904 |
| Test pits and borings | 377 |
| Building | 191,466 |
| Condenser system: | |
| Intake and discharge tunnels from station wall to screen well and pump house, including open discharge flume | 73,776 |
| Intake and discharge tunnel outside building | 20,945 |
| Screen well and intake house substructure | 32,884 |
| Screen well and intake house superstructure | 17,264 |
| Cofferdam for screen well and intake house | 5,210 |
| Dredging in front of forebay | 9,281 |
| Switchgear and wiring: | |
| Electrical structures | 32,939 |
| Signal equipment | 4,204 |
| Coal storage trestle: | |
| New concrete bents | 8,958 |
| Timber work, including ties and walkway | 6,935 |
| Relay track | 1,389 |
| Retaining wall | 4,924 |
| Total structures | $420,382 |
| **Boiler plant equipment:** | |
| Feed-water system | $2,681 |
| Piping and covering | 52,220 |
| Auxiliary equipment: | |
| Low-service pumps | 2,437 |
| Painting of piping | 243 |
| Total boiler plant equipment | $57,583 |
| **Turbo-generator:** | |
| Equipment foundations: | |
| Turbine foundations | $27,052 |
| Condenser system: | |
| Condenser and auxiliaries | 89,035 |
| Circulating water piping | 8,495 |
| Screens, racks, guides, etc | 23,736 |
| Circulating water piping to old unit | 2,852 |
| Generators, exciters, etc.: | |
| Turbo-generator unit, 12,500 kw. | 261,269 |
| Auxiliary equipment: | |
| Indicating and recording instruments | 2,347 |
| Preliminary operation and tests | 1,828 |
| Total turbo-generator | $416,707 |
| **Electric plant-steam:** | |
| Station yard: | |
| Duct line and cable to intake house | 1,950 |
| Exciter, one 200-kw. | 12,005 |
| Air-cooling equipment | 1,925 |
| Air ducts, metal, including plaster | 3,144 |
| Motor-operated rheostat for old generator | 414 |
| Transformers: | |
| New transformers | 13,029 |
| Fencing | 1,645 |
| New bus tie transformers | 12,797 |
| New feeder potential regulators | 4,936 |
| Switchgear and wiring: | |
| Inserts and sleeves | 5,155 |
| Switchgear and control equipment (new) | 83,977 |
| Connections and supports | 163,994 |
| Protective equipment | 14,504 |
| Station service equipment and connections (new) | 27,399 |
| Auxiliary equipment: | |
| Painting of equipment | 609 |
| Preliminary operation and tests | 1,218 |
| Total electric plant—steam | $348,708 |
| **Total new work cost** | **$1,250,207** |

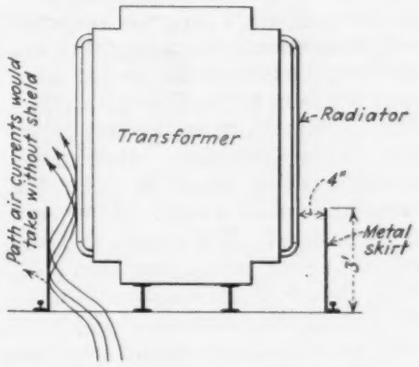
VENTILATING-AIR-DIRECTOR EQUIPMENT AS USED ON SELF-COOLED TRANSFORMER BANK

## Air Directed to Aid Transformer Cooling

IN USING forced draft to augment air circulation around self-cooled transformers it is desirable, if not necessary, to provide some means of directing the forced draft up along the transformer radiators, otherwise the air may be deflected and go off at an angle without producing the desired cooling effect. This was taken care of in the Piedmont substation of the Pacific Gas & Electric Company by placing metal inclosures or skirts around the bases of the transformers as shown in the accompanying illustrations.

The principle of operation is clearly indicated by the arrows in the sketch, whereas the other illustration shows the appearance of the completed installation. The skirts are made in two halves of 16-gage steel plate, reinforced with ¾-in. angles, and are bolted to the floor with wing nuts so they can be easily removed.

At the Piedmont substation there are four 2,500-kva. (three and one spare) 11,000/4,100-volt, self-cooled transformers cooled in this manner. The arrangement has proved very satisfactory.




PATH OF AIR CURRENTS WHEN METAL SKIRT IS PLACED AROUND BASE OF SELF-COOLED TRANSFORMERS

# Commercial Activities and Public Relations

## Sales Managers' Responsibility*

**Salesmen Must Feel Personal Sense of Duty to Employer and Be Given Definite Responsibility—Knowledge of Goods and a Workable Plan Are Prerequisites of Successful Selling**

BY R. W. TURNBULL
Pacific Coast Sales Manager,
Edison Electric Appliance Company, San Francisco, Cal.

MEN are the limiting factor in any sales effort, and it is just as important to have thoroughly capable men in the selling branch of central-station activity as it is to have trained engineers for power production. To bring out clearly some of the important factors that underlie successful selling it would be well for every power company manager and sales manager to bear in mind four cardinal points, which in the opinion of the writer are vital to the success of any sales organization:

1. Every employee should have a full understanding of his personal responsibility for the company's progress.

2. Every employee should be given a definite personal responsibility and the authority to carry it out.

3. Every employee should have a complete knowledge of the goods he is selling.

4. A practicable, workable selling plan should be given to each sales representative.

*Personal Responsibility.*—Without a sense of personal responsibility for the company's progress salesmen will thoughtlessly do things that are anything but beneficial to the company and will be careless of matters that are important to the best interests of the company. How many salesmen know what it costs the company to make a sale? How many of them care? The reason is probably that they have never been told. They should be shown something of the cost to the company of the work they are doing and should be taken into the confidence of the sales manager. Show them that their interest in these matters has a direct relation to their own profit in the work they are doing—and make it true. If they can help in cutting down selling costs, they should be allowed to share in the profits. If these things be done, the sales force not only will build business but will create a good will for the company that cannot be secured in any other way.

*Definite Responsibility.*—No system will so quickly find the weak spots in a selling organization as to place the responsibility on the individual. Each man should be given a definite job and authority with which to do it. If the job is not done, the man knows that he alone is responsible. With this knowledge he is going to put forth a greater effort to do his work well. Failure to apportion work in a definite manner will result in the organization carrying a weak man on the backs of the stronger men. This excess burden on the good workers not only is unfair to the men and the company but it affects the spirit of the men and lowers their morale, because they feel that they are doing more than their share. Specific territories allotted to each man and quotas given for special work based on territorial opportunities and productivity allow the sales manager to watch his salesmen's work. It enables him to give help where help is needed and to weed out weak men in the organization and give proper compensation to the real producers.

*Knowledge of the Goods.*—This question of knowledge of goods has probably received more comment and called for more conversation than any other one thing in the salesmen's manual, but the surprising part of it is that men are still called salesmen who not only do not know all they should about their merchandise but in many cases actually do not believe in it. Still they are called salesmen and pose as such.

Successful selling of electric household appliances depends upon the salesman's ability to convey to his prospect an appreciation of the value of the service to be rendered by his merchandise. If this is to be done, every possible convenience feature

*Abstract of address before meeting of Commercial Section, Pacific Coast Electrical Association, Santa Cruz, Cal., Nov. 12, 1926.

## Attractive Salesroom Opened by Colorado Company

NEW offices with an attractive appliance display room have recently been occupied by the Southern Colorado Power Company, Pueblo, Col. The new quarters were dedicated with a public reception at which approximately 12,000 persons were present.

The main floor occupies 6,120 sq.ft., with a space 30x50 ft. set aside for appliance display. Back of the display space are the cashier, local accounting department and contract clerks, and in the rear of the building are the general offices. A fully equipped electric kitchen in the basement, display room for heavy-duty appliances and an employees' recreation and convention hall are features of the new quarters.

and the value of every form of service the appliance will give should be so thoroughly known and appreciated by the salesman that he can tell it in a manner that will leave no doubt in the mind of the prospect. Salesmen can best do this by discussing the value of their merchandise in a "use it" atmosphere. Many salesmen make the mistake of promoting reasons why the prospect should buy rather than giving information regarding the value of the goods in service, but it is the service rendered that the prospect is buying rather than the goods themselves, and it is this new and convenient service that will attract and hold the interest of your customers in electrical merchandise.

One excellent means of aiding a salesman in gaining a better knowledge of the goods he is to sell is to make use of manufacturers' representatives. No sales manager should let a factory representative get away from his office without getting all the information he has about his goods for the benefit of the men who are commissioned with the job of selling the goods. Manufacturers' representatives and frequently jobbers' salesmen have a specialized knowledge of their product, and this information should be available to the sales manager for the asking. A salesman should know his goods so well and sell them so well that every customer will be a sales agent also. This is what enthusiastic belief does in a sales department.

*Organized Selling Plan.*—Those of us who have been in sales work for any length of time, if we are honest, will remember many times when we have started out in the morning with no plan for the day. How many salesmen go out the door in the morning and flip a coin to see whether they will go east or west? Sales managers would be surprised if they asked their salesmen this question. This indecision exists because their work has not been planned. If they are good men, their work is worth careful planning.

If a sales force does not thoroughly know the story of everything it has to sell, many doorbells will be rung without the salesman knowing what he is going to say when the door is opened. This destroys on the salesman's part the feeling of confidence, which is the first requisite of selling. Planning for the men or with them deserves careful attention if they are to know what they are going to say and when to say it. A good slogan would be "Tell more and sell more."

The question may be asked, "How are we going to have the type of men who will follow such plans and who will take this proper attitude toward our company?" Salesmen, like sealing wax or automobiles, will be found in the quality for which one is willing to pay. If sales work is properly planned, an employer may expect to get exactly what he pays for. It is to be recommended that the value of the salesmen to the sales department of the power company be recognized in the dollars represented on their pay checks. High-grade salesmanship is to be had if the company is willing to pay for it.

## The Boston Edison Safety Organization

SINCE 1913 a continuously functioning organization for safety work has been active on the system of the Edison Electric Illuminating Company of Boston. There are now about 3,250 employees in the company and 110 safety representatives, whose accident prevention efforts are co-ordinated by a general committee of corresponding title. This accident prevention committee is composed of nine members appointed by the president of the company to serve for a period of one year, and its organization with respect to external and internal contacts is shown in the accompanying chart. The superintendent of the employment bureau, H. W. Moses, is the permanent chairman of the committee, and the company's safety engineer, W. A. Cooldige, is the permanent secretary. Departmental safety representatives are appointed by department heads, and to facilitate the work, the larger departments of the company form their representatives into departmental safety committees, which make intensive studies of safety within their respective branches of the company organization.

Weekly meetings of the accident prevention committee are held in the offices of the permanent chairman, and these usually take about two hours each. Minutes summarizing the proceedings are regularly typed and filed, and as is customary in such work, special study is given to the lessons of specific accidents. When expedient, persons involved in accidents are invited before the committee to throw as much light as possible upon causes and prevention. The appointed safety representatives from each of the charted departments sit at each meeting of the accident prevention committee, and every one of the 110 safety representatives sits in this committee meeting at least once a year. Quarterly meetings of the committee of nine and of all the safety representatives are also held.

No data are available to express concretely the value of the accident prevention work, but during these years the interest of employees in safety has been greatly enhanced and the physical property of the company

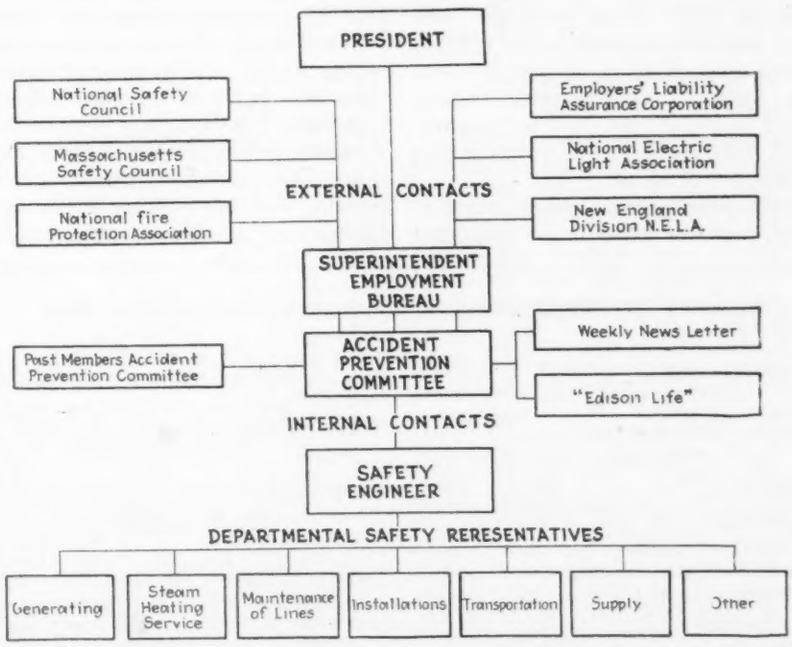



CHART OF ACCIDENT PREVENTION COMMITTEE'S ORGANIZATION AND CONTACTS

has been pretty thoroughly gone over from the safety engineering standpoint. All plans of the construction bureau for new installations of plant are examined for safety, and a large part of this work is done within the bureau itself. At present the committee is chiefly occupied with the task of bringing the importance of accident prevention home to the individual employee. Aside from the material developed within the company for study and action, the outside contacts of the committee as indicated on the chart prove valuable aids in the varied branches of safety work which touch the manifold activities of the Boston Edison Company.

## Radio-Interference Studies of Detroit Company

REQUESTS for investigation of alleged "power leaks" interfering with radio reception were first received by the Detroit Edison Company in 1922. Since then the company has investigated every call received and made a record thereof. The form of questionnaire (reproduced herewith) adopted in January, 1923, has been in use, with minor changes, ever since.

Each year the number of interference calls received has increased more than three times over the preceding year, and the calls received during the three winter months of 1925-26 exceeded in number those received during the whole three preceding years. From present indications this ratio of increase will not be greatly lessened for a year or two. From 53 to 73 per cent of these calls occur during the three winter months, and only about 2 per cent during each of the summer months, with a minimum in July. This seasonal variation is natural for several obvious reasons, chief among them being that static causes so much interference on distance reception in summer that most people turn to local stations and interference seldom is sufficient to suppress local reception.

Of 1,000 cases of interference reported, only 15 per cent (151 cases) were found to be caused by the Detroit Edison equipment. Of the latter cases, about 41 per cent were caused by primary fuses, 16 per cent by street-lighting circuits, 12 per cent by primary grounds, 9 per cent by primaries in trees and 5 per cent by traffic flashers; the remainder (17 per cent) were due to a number of different causes.

The questionnaire used in connection with applications for investigation of supposed interference contains a number of items for the purpose of suggesting to the owner of the radio set that other than company equipment may be causing his trouble. An attempt is made to have all telephone calls routed to the radio interference division in order that correct information may be given the applicant. Many cases of trouble can be diagnosed by telephone, making personal calls unnecessary. This results in saving time for both the applicant and the company.

REPORT OF INTERFERENCE WITH RADIO RECEIVING SETS

No.....

Report by Phone..... Call Received by.....
Letter..... Date.....
Verbally*..... Office.....
Yellow Kid.....

*Name* .....*Town* .....
*Address* .....*Near* .....Phones: { Home..... Bus.....
Type of set used .....No. of Tubes .....
How long have you used this set?.....Noise how long?.....
Where on dials is interference loudest?.....On with local stations?.....
Is interference a hum, buzz, squeal, hiss, tap, crackling, frying, roar, continuous?...
Does this effect occur nights only.....day and night.....Intermittent?.....
Do you use A or B battery eliminators?.....Make?.....
If not, are your batteries in good condition?.....
Do your neighbors experience the same trouble?.....
Does removing the aërial clear the noise?.....
What kind of aërial is used? Loop, outside, attic, socket.....
Is there a street car line near by?.....Street light?.....
Any shops or neighbors using motors in vicinity?.....
Name of concern who said trouble was caused by D. E. Co. .....
Does noise continue when main lighting switch is pulled?.....
When, between 8 a.m. and 5 p.m., is there someone home who operates set?....
Remarks .....
.....
It is preferable to refer call directly to Ra.2100-STA.225.
*Investigation*.....

FORM OF QUESTIONNAIRE USED BY DETROIT UTILITY

## No-Accident Pennant Has Moral Effect

AT THE plant of the Beverly (Mass.) Gas & Electric Company the pennant illustrated is flown after each day in which no accident has occurred on the system, this being a feature of a campaign to cut down accidents during a stated period ending in the spring. The "moral effect" on employees and the public is obvious in connection with efforts to attain a no-accident bogy from day to day.

## 17,878 Lamps Sold in Month's Campaign

DURING November, 1926, the Northwestern Electric Company, of Portland, Ore., conducted a Mazda lamp campaign that resulted in the sale of 17,878 60-watt inside-frosted lamps through direct mail and employee selling. A significant fact in connection with the campaign is that prior to this campaign the company had never sold Mazda lamps in its principal district, which is the city of Portland.

The gross merchandise profit on the venture was approximately $1,800, and it is estimated that there was added in the neighborhood of 180 kw. of connected load, which will undoubtedly bring in additional revenue each year.

The company feels that the campaign was definitely educational in that it introduced the new inside-frosted Mazda lamps into the homes of its customers in a much shorter time than would have been possible in the ordinary course of events.

# Digest of Electrical Literature

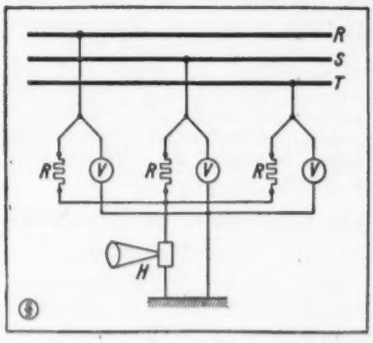
## Hydro-Electric Development and Steam Equipment

*German Turbine Construction.*—ALBERT UNGERER.—The relatively small water powers available in Germany, which can in no way be compared to those in northern Europe, not to speak of America, have forced upon German designers of turbines the necessity of utilizing even widely varying quantities of water to the fullest possible extent. Turbines have hence been developed the efficiency curves of which rise steeply and then continue in an approximately horizontal line. The development has required an exceedingly careful study of guide wheels, as well as thorough and numerous model tests. The results of these investigations became apparent in the further development of Francis turbines, the efficiency characteristics of which may in general be described as flat—at least for low and moderate specific speeds—with the main object to raise the average efficiency. In the very carefully conducted trials of the Walchenseewerk turbines a maximum efficiency of 91 per cent was reached. These turbines were constructed for developing 24,000 hp. under a head of 197 m. at 500 r.p.m. There were times when the designer had to rely upon theory rather than upon experience in adapting to very high falls the guide mains in use for low falls. The Aufkirchen turbines are of the spiral vertical type, with spiral sheet-metal casings of circular cross-section. The efficiency of these machines rose to 92.6 per cent. These turbines are fitted with air valves which admit air into the draft tube before the admission adjusts itself for light loads. By these means damage to the guide wheel, owing to the sudden reduction of the load, is prevented and the light-load losses are reduced to a considerable extent. The further development of high-speed turbines, at present built mostly of the propeller type, also necessitates the maintenance of high efficiency. German turbine construction has tended to a development not only of propellers with six vanes, of the Catlin and other types, but also of Catlin turbines with movable vanes, which at present appear far superior to all other high-speed turbines with respect to the average efficiency.—*Engineering* (*England*), Dec. 3, 1926.

## Generation, Control, Switching and Protection

*Determination of Temperature Corrections and the Regulation of Transformers.*—EDMOND REGLI.—In order to reduce mistakes the author has found it advisable to make up his own curves and charts as applied to a determination of temperature corrections and the regulation of transformers. Experience in calculating temperature rise, percentage rise of resistances when calculated up to 75 deg. C. and regulation of transformers has shown that the use of curves and charts for obtaining the values has many advantages. This article describes some of the methods and charts that have been used.—*Electrical Engineer of Australia and New Zealand*, Nov. 15, 1926.

*Ground Detector for Isolated Systems.*—L. BRANDENBURGER.—The connection of three voltmeters to the three phases of an isolated three-phase system is an old and reliable method to announce visually a ground on any one phase. Considerable difficulties are encountered when an acoustical signal is desired. Contacts on voltmeters cannot be made sufficiently sturdy to insure permanent reliability. A bell or horn in common with the Y-ground line will sound in case of a ground, but its indication is objectionable because the voltage across it is added to the faulty phase affecting thus the indication of the instruments in the sound phases. An arrangement like the one shown in the sketch was found to give satisfactory service. Parallel to the phase voltmeters are three carbon-filament lamps, and in their Y-point is placed a horn to ground.—*Siemens Zeitschrift*, November, 1926.




SCHEME FOR AUDIBLE SIGNAL ON GROUND DETECTION FOR ISOLATED SYSTEMS

## Transmission, Substations and Distribution

*Automatic Rectifier Station.*—J. BLANDIN.—For the supply of a large section of Brussels with light and power a substation has been erected in which are installed eight mercury-arc rectifiers feeding a bus system from which lead ten feeders of 1,000 amp. and 220 volts each. The entire equipment of the station is arranged for full automatic operation. Four incoming cables furnish three-phase, 5,250-volt current. To minimize fluctuations of voltage two automatic induction regulators are provided with a range of plus or minus 500 volts. Four self-cooled 585-kva. transformers, wound three-phase-six-phase, supply the rectifiers with 239-volt phase voltage. To insure a uniform distribution of the load upon the individual rectifiers, a current-transformer-operated equalizing set influences the setting of the induction regulators. To introduce the necessary amount of stability, a certain degree of overcompounding is maintained automatically by the regulators. Numerous relays for voltage control, overload protection, rectifier ignition from either the alternating-current or the direct-current side, tripping and delayed reclosing of switches, starting and stopping of vacuum pumps, protection against overheating, etc., are installed, and their connection is shown in detailed wiring diagrams.—*Brown, Boveri Company, Mitteilungen*, November, 1926.

*Sag and Stress Chart for Overhead Lines.*—C. H. STUBBINGS.—The determination of the sag and stress of a wire hanging in a catenary under certain conditions of temperature and loading may be effected mathematically or graphically, given the stress under certain other conditions. An attempt has been made in this paper by the author to eliminate difficult mathematical terms and equations so that the problem may be attacked from the known data without any preliminary calculations. A table is given in the article, prepared for a range of sizes of conductors under the conditions of loading of regulatory commissions. The fundamental equation upon which the chart designed by the author is based is developed in detail. The method of using the chart and the general procedure for its application are given with an example.—*World Power*, December, 1926.

## Units, Measurements and Instruments

*Ohmmeter for Wide Range.*—R. KÜHNEL.—By slight changes and simplifications of a recently patented method of measuring ohmic resistances the author succeeded in providing a portable, direct-reading ohmmeter, which has a range of 0.001 ohm to 300,000 ohms, and a second type for 0.00001 ohm to 1 ohm. The paper describes the theory of this new measuring device and gives complete wiring diagrams of its various component parts. The indicating instrument is a moving coil galvanometer with an adjustable magnetic shunt. A 2-volt storage cell is required for the lower ranges, and a 14-volt dry-cell battery is needed for the high-resistance ranges. The operation of the device is very simple, making it applicable for routine use in manufacturing plants by unskilled labor.—*Elektrotechnische Zeitschrift*, Nov. 11, 1926.

*Condenser Bushings for Measuring Purposes.*—G. KEINATH.—The cost of potential transformers for voltages of 70,000 and above is so high that their use for voltage and energy measurements is warranted only if these values must be determined with greatest accuracy. In all other cases, when errors of about 5 per cent are permissible, high-voltage bushings of the condenser type give a simple means to measure the potential of the circuit, which passes through the bushing. In general, the accuracy of measurements of this type is influenced (1) by the wave shape, (2) by the frequency, (3) by the temperature, and (4) by the humidity. The detailed article elaborates upon these four factors, ex-

plaining the reasons and stating the magnitude of error. During the last few years great improvements were made in these types of measuring devices, particularly with a combination of condenser and small auxiliary transformer. Practical experience with mega-wattmeters of this type, used in a large substation along with precision-type wattmeters, revealed an average error of 1 megawatt in 30. A project of a 110-kv. outdoor substation was recently submitted to a large power company, the cost of which was 2,300,000 marks with potential transformer measuring equipment and 1,600,000 marks with condenser-type measuring equipment.—*Siemens Zeitschrift*, October and November, 1926.

## Illumination

*Modern Tendencies in Street Lighting.*—According to the author of this article, adequate street lighting calls for five things: (1) Sufficient light to see clearly, (2) an even distribution of light, (3) an absence of glare, (4) a pleasing appearance by day as well as by night, and (5) economy in cost of installation and operation. Comparing the evenness of illumination with symmetric and asymmetric distribution —assuming a street 70 ft. from curb to curb with 1,000-cp. lamps mounted 15 ft. high to light center, arranged opposite one another and spaced 120 ft. apart—the values contained in the accompanying table are obtained.—*Electrical Engineer of Australia and New Zealand*, Nov. 15, 1926.

COMPARISON OF STREET-LIGHTING VALUES

| Horizontal | Symmetric Distribution | Asymmetric Distribution |
|---|---|---|
| Average foot-candles | 0.210 | 0.485 |
| Maximum foot-candles | 0.343 | 0.523 |
| Minimum foot-candles | 0.118 | 0.468 |
| Uniformity factor | 0.344 | 0.895 |

## Motors and Control

*Hunting of Synchronous Machinery.*—R. LOCHNER.—An attempt is made in this paper to attack the problem of hunting from a mathematical standpoint, with a view to obtaining methods which will indicate, with a minimum amount of calculation, whether or not hunting is likely to occur in any particular case. Separate sections are devoted to a consideration of the disturbing impulse, the synchronizing torque and the natural frequency of oscillation, and in the last-named a method is presented by means of which troubles from hunting or torsional oscillation of the alternator shaft may be avoided. An example in which the effect of altering various parts of the generating unit is examined is worked out.—*Journal of Institution of Electrical Engineers* (*England*), December, 1926.

*Speed Control of Electric Crane Motors.*—A. C. BARSON.—The author deals in this article with the question of speed control of crane motors, describing briefly the various methods used and indicating generally which particular type is best suited for certain particular designs of cranes in order to obtain the required operating results. Four chief types of control used for crane work on a direct-current supply are: (1) Plain series, (2) armature diverter, (3) rheostatic brake, (4) potentiometer. The author takes up in detail each one of these four types of control and enumerates their respective advantages and disadvantages from an operating viewpoint.—*Electrical Times* (*England*), Dec. 9, 1926.

## Heat Applications and Material Handling

*Maintenance of Insulating Oils.*—L. GONTIERS.—Oil used in switches and transformers requires occasional reconditioning to remove water and impurities. Although formerly only the filter press was available for this purpose, the centrifuge has become quite popular in late years. It is claimed that a well-built centrifuge is able to remove 95 per cent of all the impurities of oil and that a biannual cleaning will maintain the dielectric qualities of a given oil volume at a constant level. Tests and experiences in the field seem to indicate that centrifugal cleaning of oil gives a more thorough reconditioning, judging by the higher dielectric strength of the oil when cleaned by this method as compared with the filter press method. A large part of the paper is devoted to an exact explanation of the theory of a modern multicone oil centrifuge of French origin.—*Revue Générale de l'Electricité*, Oct. 16, 1926.

## Electrophysics, Electrochemistry and Batteries

*Metals to Resist Corrosion or High Temperatures.*—H. J. FRENCH.—A discussion is given of some of the principal characteristics and typical applications of metals used industrially to resist high temperatures or corrosion. Those considered include commercially pure copper, aluminum, lead, tin, silver, nickel and iron, and alloys in which these are the predominating elements. The report is primarily a résumé of previously published but widely scattered information, and somewhat more emphasis is placed upon industrial applications than on laboratory test data.—*American Electrochemical Society*, Oct. 11, 1926.

## Telegraphy, Telephony, Radio and Signals

*Line-Current Regulation in Bridge Polar Duplex Telegraph Circuits.*—S. D. WILBURN.—A mathematical analysis of the bridge polar duplex telegraph circuit, under the condition that the bridge arms are of equal resistance, shows that there is a particular bridge-arm resistance which results in maximum received current. As the bridge-arm resistances are increased beyond the value giving this maximum the received current diminishes gradually. On the other hand, as the bridge-arm resistances are decreased below the value giving the maximum the received current drops off very rapidly. It follows that when necessary to limit line current the maximum received current is obtained by placing the regulating resistance in the bridge arms. According to the author of this paper, experience has shown that in many situations where difficulty is encountered in operating a duplex telegraph circuit with the regulating resistances in the line a very decided improvement is obtained by transferring these resistances to the bridge arms.—*Bell System Technical Journal*, October, 1926.

*Modern Telegraph Operations.*—G. N. PERKINS.—The speed at which a long, unloaded submarine cable may be efficiently worked is limited by the attenuation and distortions to which the signals are subjected in their travel. Limiting speed of a cable working simplex is given by the condition that the signals are of legible amplitude and not so distorted that there is the slightest doubt as to the identity of any one of them. This critical speed will be slightly reduced in the case of duplex workings and again reduced if a relay replaces a recorder as the receiving instrument. The article discusses in some detail the removal of the distortion and attenuation in the cable and describes the type of regenerator working on cables employed by the Eastern Associated Telegraph Company of Great Britain.—*Electrician* (*England*), Dec. 3, 1926.

## Miscellaneous

*Production of High-Voltage Cathode Rays Outside of the Generating Tube.*—W. D. COOLIDGE.—Until very recently the cathode-ray tube has remained a low-voltage, low-current device when compared with the modern high-voltage X-ray tube and has, for its operations, always had to be connected to the pump system. It has now been found possible to develop a type of cathode-ray tube which can be sealed off from the pump and is capable of operation at several milliamperes and up to at least 350,000 volts. In the introductory part of his paper the author devotes some attention to a brief resumé of the historical background of the subject, followed by a general description of the newer tubes, experimental models of which have been made in various sizes ranging in over-all length from 53 cm. to 155 cm. Some of the constructional difficulties which were encountered in the development of these tubes are discussed in detail. It is indicated that the possibility of using still higher voltages for the operation of these tubes is well within the range of early experimentation.—*Journal of Franklin Institute*, December, 1926.

*Practical Points on Cable Manufacture.*—A. I. TRACEY.—This paper was presented before the National Association of Supervising Electricians in London just recently. It deals in great detail with the mechanics of cable structure and its testing for strength. The mechanism of cable breakdowns from a thermal, mechanical and chemical point of view, with some discussion of ionization and corona effects, are among the things of interest in the paper. Three-cord supertension cables come in for a share of the author's attention. Stress calculations for such cables are detailed.—*Electrical Times* (*England*), Dec. 30, 1926.

# News of the Industry

## Joint Regulation Plan

### Addition to Clause Which 200 New England Companies Are Requested to Include in Contracts

UNDER date of Jan. 15, the committee of electric power companies co-operating with the power committee of the New England Council and headed by Charles L. Edgar, president of the Boston Edison Company, transmitted a letter to more than 200 power companies in New England calling attention to the steps recently taken toward the establishment of joint regulation of interstate power contracts by state utility commissions acting upon the voluntary inclusion of appropriate clauses in such contracts by the parties thereto.

The letter calls special attention to the present lack of jurisdiction of the state public utility commissions over such interstate contracts and points out that there is grave danger that the present limited jurisdiction of these commissions may invite federal control.

The first paragraph of the proposed agreement for insertion in New England interstate power contracts was printed in the ELECTRICAL WORLD for Nov. 27, 1926, page 1132. H. C. Attwill, chairman Massachusetts Department of Public Utilities, in concurring in the draft as printed feels that it would be better if the clause contained some provision for an initiative on the part of the public utility commissioners when they felt that the contracts materially affected a rate case which was duly and legally before them and were of the opinion that the rates contained in the contract might be found upon investigation to be unjust or unreasonable. Moreover, he feels that his attitude in concurring in the draft ought not to be taken in any sense as indicating that contracts containing this provision would by reason thereof be approved by the Department of Public Utilities of Massachusetts.

To put concretely the thought of Mr. Attwill, the committee has drafted a second paragraph to the proposed clause to be inserted in interstate contracts, its inclusion, however, not being considered advisable in every case by W. Rodman Peabody, vice-president Turners Falls Power & Electric Company, who with Mr. Attwill drafted the clauses. The complete proposed clause follows, the addition being inserted in brackets:

> After three years from the date hereof if at any time either of the parties hereto shall make a written claim upon the other party that the rates herein, not subject to regulation by the constituted authority of any state, are unjust or unreasonable and the said parties fail to agree within six months after the date of said written claim upon new rates, then either party may file an application with the public service or public utilities commission of either of the states between which the sale or transmission of electric current, power or service shall take place under the terms of this contract requesting that the disagreement between said parties shall be determined by the public service or public utilities commissioners of each of the said states. If the public service or public utilities commissions of each state acting through a majority of each board after hearing the parties shall determine in accordance with law that a modification of the contract in respect to the rates set forth therein should be made, such determination shall, from and after the date fixed in such determination, act as an automatic revision of the rate schedule fixed in said contract and such revised rate schedule shall remain in force for five years from the date of such determination, after which either party may again ask for arbitration of rates in the manner hereinbefore described.
>
> [If in any rate proceedings duly and legally pending before the public service commissioners or public utilities commissioners in either of said states it shall appear to such commissioners that the rates under this contract may be unjust or unreasonable and materially affect the question of rates pending before them, such commissioners may request the commissioners of the other state to join with them in determining the justice or reasonableness of the rates under this contract, and thereupon the commissioners of each state may through a majority of each board, after hearing the parties and in the same manner as herein provided upon application made by one of the parties hereto, determine a modification of the contract in respect to rates, which determination shall be of the same effect as herein provided when made upon the application of a party hereto.]

## Passage of Swing-Johnson Bill Unlikely

### Further Engineering Studies Advocated—Senator Hiram Johnson Issues Statement Denouncing "Selfishness and Avarice of Power Companies"—President May Act

BY PAUL WOOTON
Washington Correspondent, ELECTRICAL WORLD

INDICATIONS all are that the Swing-Johnson bill, providing for the construction by the government of a high dam in the Colorado River in Boulder Canyon, cannot be passed at this session. In addition to those who are opposed to the plan because of the prospect of setting up the government in the power business on a large scale, there are others who are not influenced particularly by that probability, but who contend that the project has not been studied sufficiently from an engineering standpoint. They admit that one government agency, the Bureau of Reclamation, has reported favorably on the project after extensive engineering studies, but there is some apprehension that this has been a pet project of that bureau. Engineers in other bureaus have taken divergent views.

In view of that situation there is a demand for further engineering studies. Some are of the opinion that it would not be good business to bring in 600,000 hp. on a market that is fully supplied. It is true that ten years would be required to build such a dam, but it is pointed out that industry will not pause for ten years waiting the completion of this project. When it comes in, the market is expected to be as fully supplied as at present.

Since the government frequently is called upon to undertake non-feasible projects—the feasible ones usually are not laid on the government's doorstep—members of Congress are insistent on very comprehensive engineering reports. In the opinion of many members the power resources of the Colorado River should be developed gradually, and as private enterprise is anxious to undertake the work in that way, they fail to see why the government should advance the $125,000,000 to carry out a development which will interfere with the complete utilization of the river's resources. Senator Hiram Johnson of California says there is a sinister aspect to the opposition. In a formal statement he accuses its opponents of organized propaganda and says that the protests received show a "lack of knowledge of the bill and an utter misconception of its provisions."

"The Swing-Johnson bill," Senator Johnson says, "contains alternative provisions designed to give the Secretary of the Interior freedom to act in the best way for the protection of the government. Under one provision the Secretary may build and operate power plants and dispose of the power at wholesale at the dam; under another provision the Secretary may build the power plants and lease the units therein, and under still another provision the Secretary may lease the use of the water for the generation of electrical energy, leaving to the lessees the matter of building and operating the power plants. The magnitude of the enterprise, its interstate relation and its international character make this necessarily a national undertaking. An alternative mode of disposing of the power and power rights is wise and salutary. It but gives flexibility to a monumental work that has greater possibilities for the welfare of our people and for their prosperity and progress than any proposed legislation of this generation. Apparently, the fight has now been taken up by power companies against this beneficent legislation. If power companies interpose their selfishness and avarice to prevent this great boon, if private individuals place their greed for profits above the safety and welfare of our people, we will endeavor to make the situation plain and upon the lines now forced upon us press to a definite conclusion the people's right to their own."

A resolution authorizing the President to appoint a board of five engineers to make a further investigation

of the lower Colorado River has been introduced by Senator Phipps of Colorado. The bill provides that two members of the board are to be chosen from the Department of the Interior and two from the War Department, one to be an outside engineer. The board would have full authority to report on the "most economical, efficient and feasible method of control or prevention of floods, use of water for domestic and irrigation purposes, and for the production of hydro-electric power." It proposes an appropriation of $100,000 for the purpose.

There is a rumor that the President is considering the appointment of a commission for the purpose of advising him in the matter.

## Another Minority Report on Swing-Johnson Bill

In addition to the two minority reports opposing the Swing-Johnson bill, which provides for government construction of the proposed Boulder Canyon Dam, with attendant features of power generation by the United States, brought in by Representative Hayden of Arizona and Representative Leatherwood of Utah respectively, as noted last week, a third minority report from the House committee on irrigation and reclamation has been presented. This report is from Representative Whittington of Mississippi, who says that he is "opposed to the Government going into the utility business" as a matter of principle. He declares that there is no reason for the United States financing the proposed project other than possibly that part providing for flood control and reclamation. The rest of the project, if it is carried out, should be financed by private capital or by localities benefited.

An interstate conference at which negotiations between California, Arizona and Nevada with reference to the problems arising from the development of the Colorado River will be renewed, "with the sincere hope that they will speedily culminate in an amicable and satisfactory settlement," was predicted on Jan. 14 at Sacramento, following the sending by Governor C. C. Young of California of communications to the governors of the other two states asking them "to advise him when committees from their states will be able to meet the California committee."

## Farmers' Fertilizer Corporation Revises Shoals Bid

With the presentation to Congress on Jan. 17 of an amended Farmers' Fertilizer Corporation offer for Muscle Shoals, former Senator A. O. Stanley of Kentucky issued a statement to the effect that the revised bill meets all criticism raised against the corporation's proposal as it was first introduced on Dec. 9. It clarifies those portions relating to the termination of the lease and the disposition of rentals, Senator Stanley says, and removes all possibility of the government assuming any further financial obligation in connection with the building of Dam No. 3 or future up-river development.

# For Federal Department of Public Works

### American Engineering Council Indorses Wyant Bill at Its Washington Meeting—Results of Study on Safety and Production—Schwab and Hoover Talk

ADOPTION, as anticipated, of a definite legislative program covering public works was perhaps the chief event of the two-day annual meeting of the American Engineering Council, which closed in Washington on Jan. 14 with a dinner at which Charles M. Schwab, president of the American Society of Mechanical Engineers, and Secretary Hoover of the Department of Commerce delivered notable addresses foreseeing new fields of usefulness for the engineering profession acting through the Engineering Council. The sessions of the council assembly were held at the Mayflower Hotel and the dinner at the New Willard.

The assembly meeting sanctioned a public works measure to be introduced in the House of Representatives by Adam M. Wyant of Pennsylvania. This bill embodies the essential features of the report of the council's special committee adopted at the last meeting of the administrative board held at Cornell University. By it the name of the Department of the Interior would be changed to the Department of Public Works and Domain. Thorough provision is made in the bill for the reorganization and more effective coordination of the public works functions of the federal government.

The council's safety and production study, it was reported to the assembly, is rapidly nearing completion. The manuscript of the study committee's report will be ready for the printers early in March. The scope and character of the results attained were presented in lectures illustrated by lantern slides at an evening session of the assembly on Jan. 13, at which the speakers were L. P. Alford of New York, a member of the committee; J. E. Hannum, director of the study, and L. W. Wallace, executive secretary of the council.

It was voted to hold the next meeting of the administrative board at the Engineering Societies Building in New York City at a date to be fixed by the executive committee. A. W. Berresford of Detroit and O. H. Koch of Dallas were re-elected vice-presidents of the council, Harrison E. Howe of Washington treasurer, L. W. Wallace executive secretary, and James T. Grady publicity director. Dean Dexter S. Kimball of Cornell was elected president a year ago for a term of two years.

"Co-ordination of sentiment and loyalty in business with a money-making method of economy is the fundamental principle of success in industry," Mr. Schwab told several hundred men prominent in public life, engineering, architecture and the sciences who assembled at the dinner. Asserting that business ability as such is a myth, Mr. Schwab said that success was based largely on following the principles of scientific engineering. He predicted that the next twenty years would see the greatest industrial development the world has even known, expressing himself as being more optimistic concerning the country's industrial future than at the outset of his own business career.

Amplification and reconsideration of all present standards in industry were urged by Secretary Hoover, who said that closer working relations were being established between engineers and the directors of industry. A new conception of standardization, following efficiency precedents already built up, he declared, will prove the surest path to the most effective principles for elimination of waste in industrial history. In this movement, Mr. Hoover said, the American Engineering Council, as in the past, would be the instrument through which reform would be effected.

## Northwest Inspectors Hold a Successful Convention

A record of accomplishments in committee work during the year and an earnest desire among delegates to continue the good work marked the first anniversary of the Northwest Association of Electrical Inspectors and its second convention, held Jan. 17 and 18 in Portland. Standardization of electrical codes was the keynote of the meeting as expressed in the report of the retiring president, L. W. Going, chief electrical inspector of Portland.

The presence of W. J. Canada, electrical field secretary National Fire Protection Association, was found helpful in bringing discussion to bear on amplification of the national code for the purpose of making it adequate to meet the needs of administrators, thus making unnecessary the passing of special municipal codes. Mr. Canada's paper, "One Code or Babel," helped to crystallize sentiment and eventually led to the passing of a resolution embodying the association's recommendations with respect to four subjects—the use of conduit, the number of circuits per unit of area to produce reasonable intensity of illumination and capacity for appliances, sizes of mains and feeders, giving consideration to diversity, and formulation of adequate motor-wiring tables and protective methods for industrial installations.

New officers elected for the coming year were: President, H. S. Jenkins, chief electrical inspector of Bellingham, Wash.; vice-president, Tom Carlon, electrical inspector and fire chief, Bend, Ore.; secretary (re-elected), F. D. Weber, electrical engineer Oregon Insurance Rating Bureau, Portland. The bylaws were amended to let the organization include members from Idaho, Montana and British Columbia. Membership increased during the year more than 50 per cent to a total of 172 at the end of the convention. The manufacturers' exhibit was successful and is to be enlarged and made an annual event.

## Purchases and Mergers

**National Electric Power Sale Is Consummated—Wisconsin Companies Are Consolidated**

CONSUMMATION of the purchase by the Insull interests of control in the National Electric Power Company's properties, first announced last July, is now made public. These properties, formerly controlled by Albert Emanuel, are in Maine, Pennsylvania, West Virginia, Nebraska, Ohio, Indiana, Michigan, South Dakota, Kentucky, Kansas, Oklahoma and Arkansas. Included are the Cumberland County Power & Light of Portland, Me.; the Penn Central Light & Power of Altoona, the Kansas Electric Power of Lawrence, the Eastern Kansas Power of Eureka, the Northwestern Public Service of Huron, S. D.; the Southwest Power of McAlester, Okla.; the Ohio Electric Power of Oberlin, and the Michigan Electric Power of Bad Axe.

Purchase of the Southern Wisconsin Power Company and the Wisconsin River Power Company by the Wisconsin Power & Light Company has been announced by G. C. Neff, vice-president. The property value of the two companies taken over is approximately $15,000,000, and this is therefore one of the largest utility deals to be transacted in several months. The Wisconsin River Power Company owned the hydro-electric plant at Prairie du Sac, while the Southern Wisconsin Power Company owned the hydro-electric plant at Kilbourn. Both were associate companies of the Wisconsin Power & Light and hereafter will be operated as district concerns.

## Tallahassee (Fla.) Company Gets Ocklocknee License

The Federal Power Commission at a meeting held on Jan. 13 authorized a license on the Ocklocknee River for the West Florida Power Company of Tallahassee. The project involves the construction of a dam 59 ft. high to form a reservoir with 37,000 acre-feet of storage. An installation of 12,000 hp. is to be made.

A preliminary permit was authorized for the California-Oregon Power Company, covering five sites on the North Umpqua and Clearwater Rivers in Douglas County, Ore. Since the filing of the application the Geological Survey has completed a profile of the two rivers showing that the sites covered by the applications are not the only ones which appear attractive, and investigation will continue.

The commission has rescinded the preliminary permit tendered the Twin City Power Company and the Twin City Power Company of Georgia, covering a project on the Savannah River. These companies were not willing to go to the expense for engineering studies which was required.

An extension of two years has been given to the Columbia Railway & Navigation Company to begin construction on the Santee and Cooper Rivers in South Carolina. Studies indicate the possibility of material savings through providing additional storage on the Saluda River, a tributary of the Santee.

The preliminary permit issued June 14, 1924, to the American Alum Corporation of New York for a power project on the Gila River has been canceled. The corporation failed to comply with the terms of the preliminary permit.

In connection with the applications for power rights for manufacturing newsprint on Revillagigedo Island, Alaska, requests had been filed for a modification in the Forest Service timber contract.

## Temporary Order Against Los Angeles' Steam Plant

A temporary restraining order was issued on Jan. 15 by the Superior Court of California holding up the work of the Los Angeles Bureau of Power and Light on the proposed steam plant at San Pedro, the harbor of the city of Los Angeles. The order restrains the Board of Water and Power Commissioners and other city officials from disbursing any public funds, making any contracts or incurring any obligations or liabilities until the hearing on the preliminary injunction.

This decision is in the suit brought by the Southern California Edison Company, as a taxpayer, against the Water and Power Commissioners asking for an injunction to prevent the expenditure of public funds in building the harbor steam plant. The Edison company claims that such a plant is not needed, that its construction would be illegal and the waste of public funds, and that its operation would be a violation of the contract made at the time the Edison distribution system was sold to the city. This contract provides that the city shall purchase from the company all electricity needed in addition to that generated by the city's own plants on the aqueduct.

## Stanton (Pa.) Mine-to-User Plant Has Unit Ready

The first unit of the Stanton (Pa.) power station, owned jointly by the American Gas & Electric Company and the Pennsylvania Power & Light Company, will go in service the week of Feb. 1. This turbo-generator has a capacity of 50,000 kw. and is the first of eight units planned for this station. The second one will go into service in March.

Stanton is in Jefferson County, in the coal-mining regions of the west central part of the state, and the plant will on completion be the largest mine-to-user power station anywhere. Coal is taken from nearby mines, converted into electricity and thus distributed to users of light and power. It is estimated by the American Gas & Electric Company that the distribution of power electrically from Stanton, instead of shipping coal to distant points, will annually save the handling of more than 35,000 cars which would be required to coal isolated power plants supplanted by the service from Stanton.

By April 1 the American Gas & Electric Company expects to have added 81,000 kw. of new generator capacity to its various Appalachian properties in Pennsylvania and West Virginia.

## Option Is Given on Cambridge Electric Light Company

An option to buy control of the Cambridge (Mass.) Electric Light Company has been obtained by an unknown prospective purchaser of this utility, who offers $187.50 per share for the block held by the Cambridge Electric Securities Company. The par value of the stock is $25. The Securities company was organized some years ago to pool the controlling shares as a protection against free sale. The option expires Feb. 8, at which time it is expected that the name of the purchaser may be disclosed. The Cambridge company is one of the most prosperous light and power utilities in Massachusetts. It serves a highly diversified residential and industrial area in the heart of Greater Boston.

## Wisconsin Has Ten Thousand Electrified Farms

Production of electricity in Wisconsin last year exceeded production in 1925 by 14 per cent, says the Public Utility Information Bureau of that state. Seven municipally owned electric systems were absorbed by private companies. Water-power production exceeded last year, when droughts lowered the rivers, by 22 per cent. Efficiency in operation of coal-burning plants again showed decided improvement, averages for the state showing that only 1.64 lb. of coal had to be used to produce 1 kw.-hr. of electricity, whereas last year 1.87 lb. was required.

The output from hydro-electric stations aggregated 803,744,000 kw.-hr. as against 630,300,000 kw.-hr. produced during 1925. Steam-plant production aggregated 988,749,000 kw.-hr. The total output of both steam and hydro-electric stations was thus 1,792,493,000 kw.-hr., compared with 1,550,000,000 kw.-hr. last year. More than 520 wire miles of high-tension transmission lines and 1,500 wire miles of distribution lines were placed in service, and greater progress was made in extending service to farms than in any other year. Approximately 10,000 farms in Wisconsin are now receiving central-station service. Sixteen "electro-test" farms were established in nine counties.

## Smokestack on Birmingham Power Plant Collapses

Two workmen lost their lives, six others were injured, four seriously, and Greater Birmingham was deprived of electric power for almost two hours on Friday afternoon, Jan. 14, when the smokestack on top of the Birmingham Electric Company's power distributing plant at Powell Avenue and Eighteenth Street buckled 50 ft. above ground and the top 50 ft. somersaulted and dived nose-down through the roof in the center of the plant.

The smokestack had been erected a number of years and was a large one. Recently the lining became bad and a contract was let to reline it. This work was half finished when the crash came. The company is investigating the exact cause of the accident.

## A.I.E.E. Winter Convention

**Wide Range of Technical Topics, Including the Standardization of System Voltages**

STANDARDIZATION of system voltages is one of the outstanding technical topics among a wide range to be discussed at the winter convention of the American Institute of Electrical Engineers, which will be held in New York City on Feb. 7-11 inclusive, with headquarters as usual at the Engineering Societies Building. Other topics, as listed in the accompanying tentative program, include synchronous machine analyses, synchronous converter theory, losses in constant-current transformers, in synchronous machines and in armatures; plotting magnetic fields, reactances which carry direct current, cable characteristics, oil breakdown, dielectric absorption, corona space charge, circuit-breaker tests, surges on transmission lines and cables, rectifiers of electronic type, telephony and telegraphy, wire-drawing mills, alternating-current elevators, calibration and temperature compensation of meters.

On Thursday evening the Edison medal will be formally presented to Dr. William D. Coolidge, who will afterward deliver a lecture on scientific researches now under way. The John Scott medal, awarded by the city of Philadelphia, will be presented on Friday morning to Gustaf W. Elmen of the Bell Telephone Laboratories. There will be also a smoker on Monday evening at the Hotel Astor, the annual dinner dance on Wednesday evening at the same place, and the customary inspection trips to laboratories and plants in and around the city, these to take place on Thursday morning.

## A.I.E.E. Elects Twenty "Members for Life"

The constitution of the American Institute of Electrical Engineers provides that the board of directors may exempt from future annual dues any fellow, member or associate who has paid dues for 35 years or shall have reached the age of 70 after having paid dues for 30 years. The board has voted that this group be designated "members for life."

At a recent directors' meeting the following members, active in upbuilding the Institute in its earlier days, were selected for this honor: W. S. Andrews, Schenectady, N. Y.; Adam Bosch, Wyoming, N. J.; C. S. Bradley, New York; Maurice Coster, New York; W. H. Donner, Philadelphia; H. B. Gale, Natick, Mass.; William Mavier, Jr., New York; E. L. Nichols, Ithaca, N. Y.; J. D. Otten, Amsterdam, Holland; E. F. Peck, Hampton, Va.; Ralph W. Pope, Great Barrington, Mass.; Charles W. Price, New York; Edward P. Roberts, Lakewood, Ohio; Almon Robinson, Lewiston, Me.; W. A. Rosenbaum, New York; Theodore Stebbins, New York; Nikola Tesla, New York; William S. Turner, Portland, Ore.; C. R. Van Trump, Wilmington, Del., and Fremont Wilson, New York.

## Plans for Regional Meetings of Institute

Three regional meetings will be held by three districts of the American Institute of Electrical Engineers in the months of March, April and May, respectively at Kansas City, Mo.; Bethlehem, Pa., and Pittsfield, Mass.

At Kansas City a two-day meeting will be held on March 17 and 18. For the technical sessions some subjects of much interest to those in the district will be presented, including mercury-arc rectifiers, automatic substations, supervisory control, electric welding of pipe lines, electric drive in flour mills, railroad signaling, etc. The committee is also planning interesting inspection trips and a dinner-dance.

The regional meeting of District No. 2 will be held in Bethlehem on April 14 to 16. Technical sessions will be held on the first two days and the third day will be devoted to trips. Among the technical subjects will be application of electricity in steel mills, cement mills and coal mines; voltage standardization, distribution losses, high-pres-

## Program of Winter Convention of the A.I.E.E.

NEW YORK, FEB. 7-11

**Monday, Feb. 7**

*Afternoon.*—Synchronous Electrical Machines: "Synchronous Machines—III," R. E. Doherty and C. A. Nickle, General Electric Company; "Sub-synchronous Harmonics on Mmf. Wave of Polyphase Windings," Quentin Graham, Westinghouse Electric & Manufacturing Company; "Transverse Reaction in Synchronous Machines," J. F. H. Douglas, Marquette University, Milwaukee; "Starting Performance of Synchronous Motors," H. V. Putman, Westinghouse Electric & Manufacturing Company.

*Evening.*—Smoker and entertainment.

**Tuesday, Feb. 8**

*Morning.*—Electrical Machinery—Synchronous Converters and Losses: "The Synchronous Converter—Theory and Calculations," T. T. Hambleton and L. V. Bewley, General Electric Company; "Constant-Current Regulating Transformer Characteristics," H. C. Louis and Arthur Albaugh, Consolidated Gas, Electric Light & Power Company; "Additional Losses of Synchronous Machines," C. M. Laffoon and J. F. Calvert, Westinghouse Electric & Manufacturing Company; "Reduction of Armature Copper Losses," Ivan H. Summers, General Electric Company.

*Afternoon.*—Magnetic Fields and Reactances: "Graphical Determination of Magnetic Fields"—(a) "Theoretical Considerations," A. R. Stevenson, Jr., and R. H. Park, General Electric Company; (b) "Comparisons of Calculations and Tests," E. E. Johnson, General Electric Company, and C. H. Green, Raytheon Manufacturing Company; (c) "Practical Applications to Salient-Pole Machines," R. W. Wieseman, General Electric Company. "Design of Reactances and Transformers Which Carry Direct Current," C. R. Hanna, Westinghouse Electric & Manufacturing Company.

**Wednesday, Feb. 9**

*Morning.*—Voltage Standards: "Voltage Standardization of Alternating-Current Systems from the Viewpoint of the Electrical Manufacturer," H. R. Summerhayes, General Electric Company, and F. C. Hanker, Westinghouse Electric & Manufacturing Company; "Voltage Standardization from a Consulting Engineer's Point of View," R. E. Argersinger, Stone & Webster, Inc.; "Standardization of Voltage Ratings for Alternating-Current Power Systems and Equipment," A. E. Silver and A. L. Harding, Electric Bond & Share Company; "Voltage Standardization as Related to Distribution Systems," H. B. Gear, Commonwealth Edison Company; "Voltage Standardization and Its Relation to the Interconnected Companies of the Southeast," H. J. Scholz, W. W. Eberhardt and S. M. Jones, Alabama Power Company; "The Suggested Transformer Voltage Standards and Their Relationship to Pacific Coast Practice," Pacific Coast Electrical Association sub-committee on transformer standardization, H. H. Minor, chairman; "Standardization of Voltages," A. Huber-Ruf, Brown Boveri Company (Switzerland): "Combined Light and Power Systems for Alternating-Current Secondary Networks," Henry Richter, Westinghouse Electric & Manufacturing Company.

*Afternoon.*—Cables, Dielectrics and Corona: "A New 132,000-Volt Cable Joint," D. M. Simons, Standard Underground Cable Company; "Measurements on Cables and Insulators Under Alternating-Current and Direct-Current Stresses," C. L. Kasson, Edison Electric Illuminating Company of Boston; "Oil Breakdown at Large Spacing," D. F. Miner, Westinghouse Electric & Manufacturing Company; "Maxwell's Theory of the Layer Dielectric," F. D. Murnaghan, Johns Hopkins University; "Space Charge and Current in Alternating Corona," Clodius H. Willis, Princeton University.

*Evening.*—Dinner-dance.

**Thursday, Feb. 10**

*Afternoon.*—Circuit Breakers and Surge Investigations: "Tests on Oil Circuit Breakers," Philip Sporn and H. P. St. Clair, American Gas & Electric Company; "Klydonograph Surge Investigation," J. H. Cox, P. H. McAuley and L. G. Huggins, Westinghouse Electric & Manufacturing Company; "Transmission-Line Voltage Surges," J. H. Cox, Westinghouse Electric & Manufacturing Company; "Measurement of Surge Voltages on Transmission Lines Due to Lightning," E. S. Lee and C. M. Foust, General Electric Company.

*Evening.*—Edison medal presentation; lecture by Dr. William D. Coolidge.

**Friday, Feb. 11**

*Morning.*—Presentation of John Scott medal. Telephony, Telegraph and Wire Mills: "A New Electronic Rectifier," L. O. Grondahl and E. H. Geiger, Union Switch & Signal Company; "Measurement of Telegraph Transmisison," H. Nyquist, R. B. Shanck and S. I. Corey, American Telephone & Telegraph Company; "Telegraph Traffic Engineering," H. Mason and C. J. Walbran, Western Union Telegraph Company; "Developments in the Manufacture of Copper Wire," J. R. Shea and Samuel McMullan, Western Electric Company.

*Afternoon.*—Alternating-Current Elevators, Meters and Rectifiers: "Alternating-Current Elevator Motor Drive," E. B. Thurston, Haughton Elevator & Machine Company; "A Stroboscopic Method of Calibrating and Checking Watt-Hour Meters," H. P. Sparkes, Westinghouse Electric & Manufacturing Company; "Compensation of Temperature Errors in Alternating-Current Watt-Hour Meters," D. T. Canfield, Purdue University.

sure turbines, transmission-line surges, mercury-arc rectifiers, circuit breakers, induction motors and intercommunication systems.

District No. 1 will hold a meeting this year in Pittsfield on May 25 to 27. The plans for the meeting are already being developed and a good program is promised. As part of the program it is planned to hold a meeting of enrolled students. This student meeting will be similar to the meeting held in Boston last year, but it is thought that many benefits will result from holding it in conjunction with the regional meeting.

The summer convention of the Institute, as previously announced, will be held at Detroit on June 20-24, and the Pacific Coast convention will be held at Del Monte, Cal., on Sept. 13-16.

## Bills in Three States Extend Power of Commissions

A bill has been introduced in the New York State Assembly to amend the Public Service Commission law, bringing under its provisions persons or corporations selling or reselling through private meters electricity generated or sold by any other person or corporation. This bill is drawn in accordance with recommendations contained in the annual report of the Public Service Commission, as noticed last week (page 163), and is designed especially to regulate more closely service to apartment houses where the proprietor installs private meters.

A bill is to be introduced in the current session of the State Legislature at Harrisburg, Pa., which will compel all public utility companies in Pennsylvania to obtain permission of the Public Service Commission before putting rate increases into operation. Under existing laws the companies may file a schedule of new rates with the commission pending a hearing, issuing rebate certificates in the meantime.

Several bills drawn to give the Maryland Public Service Commission additional powers in dealing with public utilities, including electric light companies, have been introduced in the Maryland General Assembly, now in session at Annapolis. All the bills are administration measures and are expected to be enacted into law. One of the bills provides that the consent of the commission must be given for extensions by electric light and gas companies under franchises which have been exercised before passage of the Public Service Commission law. Another requires the consent of the commission before a company can abandon a franchise that was acquired and exercised before as well as after the enactment of that law. A third measure is designed to give the commission authority to suspend proposed rates pending a determination of their reasonableness. Another empowers the commission to fix minimum as well as maximum rates, and still another authorizes joint investigations, hearings and orders in conjunction with the commissions of other states or of the federal government in the case of interstate utilities. A bill which would restore the office of general counsel to the commission has been introduced.

## Would Facilitate Municipal Ownership in Bay State

Charles A. McGlue, chairman of the Democratic State Committee of Massachusetts, has filed a bill in the Legislature to allow municipalities to acquire electric lighting plants under less stringent terms. In support of his contention that the public may be more economically served by municipal plants, Mr. McGlue cited the city of Holyoke, with a lighting charge of 5 cents and a power charge of 3½ cents a kilowatt-hour. Under the present law a city cannot acquire a municipal electric light plant without having the City Council pass an order for that purpose by a two-thirds vote for two consecutive years and then having it adopted by a majority of the voters of the municipality. Mr. McGlue's proposed bill would provide an alternative procedure based on the initiative and referendum. A 10 per cent vote of registered voters would be sufficient to place the question on the ballot at the next city election, and if a majority of the voters indorsed the measure, then the city council or board of selectmen would be required to put it into effect.

## Regulating Powers Over Utilities Asked in Texas

It is provided in a bill which has been introduced in the Texas Legislature by Representative Nathaniel Jacks of Dallas that public utilities of virtually every class shall be placed under control of the State Railroad Commission. The bill was referred to the committee on municipal and private corporations and is expected to receive an early hearing. Under the bill the following utilities, hitherto unregulated in Texas, would be controlled by the Railroad Commission as to rates and other activities: Electric light and power companies, street-car systems, telephone and telegraph companies, interurban, motorbus and truck lines, natural and artificial gas companies, cotton gins and ice companies. The bill assesses a tax of one-tenth of 1 per cent of gross receipts for the administration of the law and provides for the employment of a solicitor and two assistants by the Railroad Commission in the enforcement of the proposed regulations. To determine rates a complete survey to fix valuations would be necessary under the terms of the bill.

## New Utility Commission Set up for District of Columbia

In carrying out the provisions of a recently enacted law setting up a separate public utility commission for the District of Columbia, the President has sent to the Senate the names of John W. Childress and Benjamin F. Adams to serve with Colonel J. Franklin Bell as members of the new commission. Blaine Mallan was nominated for the post of people's counsel, an office provided for in the new law. Heretofore the Commissioners for the District of Columbia have handled public utility matters in addition to their other duties.

Mr. Childress is the head of the Emerson Pump & Valve Company. He is a native of Tennessee but has lived in the District of Columbia since 1904. Mr. Adams is a native of New Hampshire, but was for twenty years an employee of the District of Columbia. Until 1920 he was a member of the Board of Assessors. Mr. Mallan is a native of Washington and has been practicing law there for a number of years. He has specialized in tax and corporation law.

## Damages for Radio Trouble Falsely Reported Upheld

There is no truth in a report carried by a press association to the effect that the Wisconsin Supreme Court had sustained an award of $2,000 damages made by a jury in Milwaukee last February against the Milwaukee Electric Railway & Light Company and in favor of a resident of the town of Greenfield, Wis., who alleged that the company was responsible for poor reception over his radio set. The company erected a high-tension line near the plaintiff's premises which was held to interfere with his use of radio. According to G. G. Post, electrical engineer with the Milwaukee company, the decision of the Supreme Court concerned the award of a transmission-line easement and had no reference to radio interference whatsoever. The company is conducting an investigation to learn the source of the misquoted decision.

## Columbus, Ohio, Chooses Its Street-Lighting Plan

Two or three years ago Columbus, Ohio, was called a street-lighting laboratory on account of the extensive sample installations of street lighting which had been made there. After a report by the Chamber of Commerce and ballots by residents, the city is at length taking the initial step toward the adoption of a uniform lighting system. The main business district of High Street, the chief thoroughfare, is to be equipped with intensive "whiteway" units, the secondary business district of the street with less intense illumination, and still another type of the same general design will be used in the residential part of the street. More than 500 lighting units of four types are to be installed. Those in the main business section will include 96 twin units of 1,500 cp. each, with blue-tint medium alabaster ripple globes and canopies. The lamps will be of 1,500 cp. each, with light centers 20 ft. above the ground. In the secondary business section 166 1,500-cp. units will be used at a height of 16 ft. They also will have medium alabaster ripple globes and canopies. Between the secondary business and residential sections there will be eighteen units with 1,000-cp. lamps, to prevent too sudden a decrease in intensity of illumination, while the 143 units for the residential section will be equipped with 600-cp. lamps and will have light alabaster ripple globes and canopies with asymmetric dome refractors. Lamp centers will be 13 ft. above ground. All of the electrical equipment will be supplied by the General Electric Company.

# Briefer News

**Montaup Electric Company to Install 35,000-Kw. Unit.**—The Montaup Electric Company of Fall River, Mass., is to install a 35,000-kw. turbo-generator this year as part of the program of expansion adopted by the interconnected light and power companies of southeastern Massachusetts and Rhode Island.

**No Coal Legislation by This Congress.**—Coal legislation at this session of Congress received its deathblow on Jan. 13, when the committee on interstate and foreign commerce of the House of Representatives voted, 16 to 6, against reporting favorably the bill for governmental regulation of the coal-mining industry fathered by Representative Parker of Salem, N. Y. This leaves the President in a position to continue the policy of non-intervention which he employed during the anthracite strike.

**Chicago-Seattle Telephone Line in Service.**—A third transcontinental telephone line just completed between Chicago and Seattle was opened for service from Washington by John W. O'Leary, president of the United States Chamber of Commerce, on Jan. 17. This 2,225-mile circuit is known as the Northern transcontinental line. It cost more than $1,000,000 and required more than twelve months to complete. The Boston-San Francisco line was completed in 1915 and the line from the South to Los Angeles seven years later.

**Dixie Power Company of Utah to Build on Santa Clara River.**—Permission has been granted by the Public Utilities Commission of Utah to the Dixie Power Company of Cedar City and St. George to build another hydro-electric plant on the Santa Clara River, to be rated at 800 kva., at a cost of $175,000. Although the Dixie Power Company has two small hydro plants in operation and also gets power from the municipal plant at Parowan, it has been compelled to run gasoline-driven generating units at high cost to supply its territory.

**Object Lesson for Watertown, N. Y.**—With the letting of a contract for the maintenance of its street-lighting system for a year at a contract price of $31,800, the taxpayers of Watertown, N. Y., have learned that the actual cost of operating the plant, after paying interest charges and similar liabilities, will be $96,699. This figure contrasts with the offer made by the Northern New York Utilities to do the city lighting for $70,000. The figures do not include operating costs of the municipal power house.

**Damage Suits Against San Francisco Central-Station Company for Berkeley Fire Dismissed.**—Eighty-six damage suits brought against the Pacific Gas & Electric Company, San Francisco, by the Hartford Insurance Company, based on the allegation that the breaking of a high-tension wire caused the disastrous fire in Berkeley in which many blocks of property were destroyed, have been dropped, the insurance company having decided that the power company was not responsible. Several hundred cases based on the same allegation are, however, still pending.

**New Unit Gives Horseshoe Lake (Okla.) Plant 35,000 Kw.**—Additional boiler and transformer equipment has been added to the Horseshoe Lake plant of the Oklahoma Gas & Electric Company at Harrah and put in operation, giving it a rating of 35,000 kw. and making it one of the largest generating plants in the Southwest. The Horseshoe Lake plant has two 63,000-volt lines to Oklahoma City, one 13,000-volt line to Chandler and one 63,000-volt line to Shawnee, connecting with the southern division.

**Southern Cities Utilities to Start Work on Estill Springs Plant.**—The Southern Cities Utilities Company of Chattanooga, Tenn., announces the completion of its arrangements to build a steam-power plant at Estill Springs, Tenn., having a capacity of 15,000 hp. to 20,000 hp. The plant will be ready for operation on or before July 1, 1927. It will be in the center of the territory served by the company and will aid in the eventual interconnection of all of the power plants of the company, which will then serve 29 additional communities, making a total of 83.

**Utah Governor Appoints Advisory Committee on Colorado River.**—An advisory board of 28 to consider the Swing-Johnson bill and Colorado River problems has been designated by Governor George H. Dern of Utah. It will sit with the ex-officio committee consisting of the Governor, George M. Bacon, state engineer, and W. R. Wallace, Colorado River commissioner for Utah. The advisory board includes members of the Utah Water Storage Commission, two former state engineers, members of the Legislature and other representative citizens.

**Water-Power Rights at Oswego Falls, N. Y., Consolidated.**—Completion of the negotiations for transferring the power and water rights of the American Woolen Mills to the Oswego Falls Corporation of Fulton, N. Y., gives that company a potential output of 50,000,000 kw.-hr. annually. The company now controls all the water-power rights at the upper dam near Oswego Falls, in addition to the power rights already held at the hydraulic raceway. The water power is but partly developed at present, producing only about 4,000 hp.

**Metric Victory Forecast for 1927.**—That the United States during the present year will take legislative action toward placing its merchandising on the decimal metric basis in weights and measures was a declaration made at the annual executive conference of the All-America Standards Council, held in San Francisco on Jan. 6. This opinion is based on the fact that the Stone metric bill successfully passed two of the necessary three readings in the House of Representatives, being then recommitted on a point of order, and that the metric legislation was never defeated in a general vote in Congress. At one time, Aubrey Drury, director of the council, said, a metric standards bill passed the House of Lords in Britain; at another it lacked only five votes to win in the House of Commons. The House of Representatives in Australia has indorsed decimal weights and measures by a vote of 36 to 2, he said.

**Stoughton, Wis., Sticks to Municipal Ownership.**—After a long series of discussions the offer of the Wisconsin Power & Light Company to pay $335,000 for the municipal electric light system of Stoughton, Wis., was rejected, for the time being at least, when the City Council on Jan. 4 unanimously voted against it. The electric plant at Stoughton, which shows satisfactory earnings, is one of the few remaining city-owned systems of the larger class operating in Wisconsin. Stoughton will build a small additional plant at Dunkirk, bringing the total output of the city plants to 1,000,000 kw-hr. yearly.

**Packard to Give Funds for New Lehigh Engineering Laboratory.**—James Ward Packard of Warren, Ohio, originator of the Packard motor car, who is a graduate of Lehigh University, Bethlehem, Pa., in mechanical engineering, has donated a million dollars for the construction of the new mechanical and electrical laboratories at that university that were referred to in the ELECTRICAL WORLD for Dec. 4, 1926 (page 1184). The donor is said to have made only one stipulation—that it be made the finest plant of the kind in existence. The auditorium is to seat 500 and be equipped with stereopticon and motion-picture projectors.

**Survey for Shenandoah River Plant.**—A report from Virginia says that engineers are engaged in surveys for the hydro-electric plant contemplated by the Shenandoah River Power Company near Grove Hill, 18 miles south of Luray. It is said that a 17-ft. dam instead of the 12-ft. dam originally contemplated is now planned, largely increasing the potential capacity of the plant, and that construction work may begin early in the spring. Bends in the river will require that a tunnel two-tenths of a mile be drilled through solid limestone. South of the proposed plant the stream divides, and it has been found that all of the water in the river must be combined to insure the desired power.

**Los Angeles Seeks Service Rights in Annexed Communities.**—Application was filed with the California Railroad Commission on Jan. 3 by the Los Angeles Board of Water and Power Commissioners requesting the fixing of compensation to the Southern California Edison Company for certain properties which the city will take over for its Bureau of Power and Light. These properties are all within territory which has been annexed to the city of Los Angeles within the last two years. The commission will appoint

valuation engineers, and following their report a public hearing will be held. The annexed communities are Hamilton, Venice, Watts, Santa Monica Canyon, Beverly Glen, Green Meadows, Buckler and Sunland.

**One Hundred and Five Municipal Plants Sold in 1926.**—According to the N.E.L.A., 105 municipally owned or operated electric light and power plants in 27 states were sold to private operators during 1926. This number increases to a total of 1,234 the municipal plants sold, abandoned or shut down within recent years. Last year's sales were divided as follows: Arkansas, 3; Colorado, 2; Florida, 7; Georgia, 20; Illinois, 8; Iowa, 14; Indiana, 1; Kansas, 1; Kentucky, 1; Louisiana, 1; Massachusetts, 1; Michigan, 2; Minnesota, 4; Mississippi, 3; Missouri, 3; Montana, 1; New Jersey, 2; New York, 5; North Carolina, 6; Ohio, 1; Oklahoma, 5; Pennsylvania, 1; South Carolina, 2; South Dakota, 1; Tennessee, 3; Texas, 6; Washington, 1.

**Fort Atkinson (Wis.) Vote on Sale of Plant Declared Illegal.**—Despite the fact that the people of Fort Atkinson voted last November in favor of selling the city's electric and gas plants to the Wisconsin Gas & Electric Company for $450,000, the first round in a fight started to have the sale set aside was won by opponents of the sale when the Circuit Court ruled on Jan. 12 that the referendum election was not conducted in accordance with technical requirements and therefore was illegal. The Common Council had previously accepted the company's offer to pay the $450,000 into the court while the title was being tested. It is believed that the question will again be submitted to the voters. In the meantime appeal will be taken to the State Supreme Court.

**Interconnection in Nebraska.**—The progress of interconnection in Nebraska is indicated by the recent completion of a 66,000-volt transmission line connecting the Nebraska Gas & Electric Company's station at Plattsmouth with the Nebraska Power Company's plant at Omaha. Not long ago a high-tension line was erected from Council Bluffs, Iowa, a Nebraska Power station, to Missouri Valley on the Iowa side of the Missouri River and across the latter stream to Blair and Tekamah, Neb., connecting with a Nebraska Gas & Electric distributing center at Norfolk. From the later city a line running to Central City and Aurora makes an interconnection with the Central Power Company's properties at Grand Island, Boelus and Kearney. From Kearney a line runs to Holdrege, where the Western Public Service Company operates.

**New Unit for Neosho Plant Near Parsons, Kan.**—A total of $1,100,000 will be expended by the Kansas Gas & Electric Company in the installation of a new 25,000-kw. generating unit as an addition to the Neosho plant of the company, near Parsons. This will follow the expenditure of $1,000,000 for a sub-surface cable system in Wichita. The new unit will give the Neosho plant a capacity of 40,000 kw., or only a little less than the entire system produces at present, the Wichita plant comprising two 10,000-kw., one 6,000-kw. and one 4,000-kw. turbine generator and the present rating of the Neosho plant being 15,000 kw. With the installation of the new unit, Wichita will cease to be the central generating point on the system. Work will begin on the new unit in the spring, and the job will be completed by October, it is estimated.

**Fitkin Executives Convene.** — The sixth annual convention of the property managers and executives of the Fitkin utility properties opened in New York City with a smoker on Jan. 18, the delegates leaving next morning for Asbury Park, N. J., and convening there until Jan. 21, when they returned to New York for a banquet, which was scheduled to be addressed by Gen. Guy E. Tripp, chairman of the Westinghouse board; Francis H. Sisson, vice-president Guaranty Trust Company, and R. F. Pack, president N.E.L.A.

**Binghamton and Elmira (N. Y.) to Be Interconnected.**—Interconnection at 110,000 volts is now under way in New York State between the system of the Binghamton Light, Heat & Power Company and that of the Elmira Water, Light & Railroad Company, according to W. S. Barstow, president of the General Gas & Electric Corporation, which controls the company first named. For three years after the line is finished the Elmira company will take a portion of the electrical energy to be made available through the addition of a 30,000-kw. generator at the Binghamton power station. This unit is expected to be ready for operation next September. Following this period a straight interchange of current between Binghamton and Elmira will be in effect, the amount of current then passing to depend on conditions at either of the properties.

## Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, Jan. 1, page 80.]

Western Association of Electrical Inspectors—Kansas City, Mo., Jan. 25-27. W. S. Boyd, 175 West Jackson Blvd., Chicago.

Electrical Supply Jobbers' Association, Pacific Division — Del Monte, Cal., Jan. 27-29. F. Overbagh, 411 South Clinton St., Chicago.

National Association of Lighting Equipment Dealers—Hollenden Hotel, Cleveland, Jan. 31-Feb. 5. G. P. Rogers, 424 Guarantee Title Bldg., Cleveland.

Northwest Electric Light and Power Association, Commercial Section—Multnomah Hotel, Portland, Ore., Feb. 10 and 11. L. A. Lewis, Washington Water Power Company, Spokane, Wash.

American Institute of Electrical Engineers—Midwinter convention, New York, Feb. 7-10; Southwestern District, Kansas City, March 17-18; Middle Eastern District, Bethlehem, Pa., April 14-16. F. L. Hutchinson, 36 West 39th St., New York.

Kentucky Association of Public Utilities—Brown Hotel, Louisville, Feb. 18 and 19. E. F. Kelley, Louisville Railway Co., Louisville.

Oklahoma Utilities Association—Huckins Hotel, Oklahoma City, March 8-10. E. F. McKay, 307 Local Building, Oklahoma City.

Southeastern Division, N.E.L.A.—Peabody Hotel, Memphis, Tenn., April 13-15. C. M. Kilian, 404 Wynn-Claughton Bldg., Atlanta.

Southwestern Division, N. E. L. A.—New Orleans, April 26-29. S. J. Ballinger, San Antonio Public Service Company, San Antonio, Tex.

Southwestern Public Service Association — New Orleans, April 26-29. E. N. Willis, 403 Slaughter Bldg., Dallas, Tex.

Nebraska Section, N. E. L. A.—Grand Island, Neb., April 27-28. H. M. Davis, 1519 O St., Lincoln.

**Electric Operation on Virginian Railway Betters Expectations.** — Electric operation on the entire line of the Virginian Railway since Sept. 18, 1926, has more than met with expectations as to capacity, economy and reliability, according to President Charles H. Hix. The monthly coal tonnage on the Virginian has been greater than in any previous month during the history of the road, and the electrification has been tested under conditions which it was not expected would be reached for many years. Power for the twelve electric locomotives now in use is generated at the New River steam plant, where there is a capacity of 50,000 kw.

**Penn-Ohio System to Raise Rating of Toronto Station to 132,000 Kw.**—The Ohio River Edison Company, a member of the Penn-Ohio system, is having plans prepared for the installation of an additional 33,000-kw. unit with auxiliary equipment in its Toronto (Ohio) generating station. This unit is to be placed in service in the fall of 1928. With an installation now under way, ordered in December, 1925, and to be completed next September, the unit just ordered will bring the plant rating to 132,000 kw., or double its present capacity. This increase has made necessary the doubling of the capacity of the transmission line, so that the Ohio River Transmission Company has been called upon to spend more than a million dollars for a double-circuit 132-kv. steel-tower line from Toronto toward Youngstown. The new line should be in service early next year. Stevens & Wood are the company's contracting engineers.

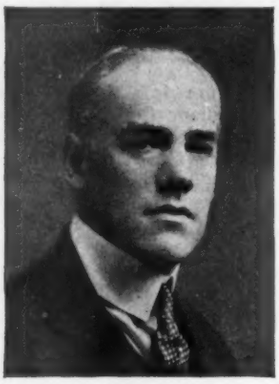
**Worcester Rate Case Under Way.**—Whether the rate base shall be the paid-in capital and premiums or a property value embracing reproduction cost will be a major issue in the case of consumers against the Worcester Electric Light Company which is now before the Massachusetts Department of Public Utilities. The city of Worcester has become a party to the case. On behalf of the petitioners evidence was presented purporting to show that the company's rates and dividends are unduly high in relation to its capitalization, which totals $4,058,232 in common stock and premiums. The maximum rate is 7 cents a kilowatt hour, which the city concedes is lower than that of any other private company in the state. The company has for many years invested a considerable part of its surplus in plant, and an appraisal is now in progress by the company which is expected to show that the reproduction value is probably between three and five times invested capital.

# Men of the Industry

## J. E. Zimmermann New President of Day & Zimmermann

John E. Zimmermann, who was elected president of Day & Zimmermann, Inc., as announced in the Jan. 15 issue of the ELECTRICAL WORLD, has been an outstanding figure in public utility circles for a number of years. Like his associate, Mr. Day, Mr. Zimmermann had considerable experience as an engineer in directing the construction of industrial plants and the administration of manufacturing before entering the public utility field.

Mr. Zimmermann is a native of Buenos Aires, and was in the service of several Argentine companies before transferring his interests to the United States. Upon his arrival in this country he became connected with the George V. Cresson Company of Philadelphia and then with the American



J. E. ZIMMERMANN

Pulley Company, advancing in the latter organization to the position of secretary. It was in 1907 that he became a member of the engineering firm of Dodge & Day, now Day & Zimmermann, Inc. Mr. Zimmermann received his education at the University of Buenos Aires and at the University of Pennsylvania. He is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the Franklin Institute.

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**F. F. McCammon,** manager of the power sales division of the Public Service Company of Colorado, has been named by the advisory board to head the Electrical League of Colorado as chairman during the fiscal year 1927.

**E. W. Judy,** formerly general superintendent of distribution of the Duquesne Light Company, Pittsburgh, has been named operating manager of the operating department just established by the company. **E. W. Oesterreich** has been appointed to succeed Mr. Judy, and **M. W. Ghen** has been appointed superintendent of the underground division of the distribution department to succeed Mr. Oesterreich. Another innovation is the establishment of a department of system development with **E. C. Stone** as manager, and the following new positions have been created: **E. A. Hester,** planning engineer; **R. L. Kirk,** work progress engineer; **L. S. Winchester,** statistics engineer; **George B. McElheney,** operating engineer, and **J. D. Roth,** plant inventory engineer. The third new department is that of the engineering division of the commercial department, in charge of **G. W. Ousler,** manager.

**Alanson P. Lathrop,** president of the American Light & Traction Company since 1909, has been elected chairman of the board of directors, and **R. B. Brown,** who had been vice-president and general manager of the Milwaukee Gas Light Company several years, has been made president, to succeed Mr. Lathrop.

**Paul B. McKee,** formerly vice-president and general manager of the California-Oregon Power Company, San Francisco, has affiliated himself in an executive capacity with the American & Foreign Power Company, New York. Mr. McKee was graduated from Stanford University in 1914 with the degree of A.B. in electrical engineering.

**Paul A. de Mars,** formerly of the engineering department, New England Telephone & Telegraph Company, Boston, has resigned to become engineering manager of the Doble Engineering Company, Medford Hillside, Mass., and assistant professor of electrical engineering at Tufts College. He is scheduled to become head of the electrical engineering department at Tufts in September next.

**M. R. Scharff,** formerly chief engineer of the Philadelphia Company, Pittsburgh, has become chief engineer of the Pittsburgh branch of the Byllesby Engineering & Management Corporation, the engineering department of the Philadelphia Company having been discontinued. The Pittsburgh branch of the Byllesby Corporation will consist of three divisions—production, engineering and construction. **R. W. Chandler** has been named in charge of the production division and in the absence of Mr. Scharff will act for the chief engineer; **George Sutherland** will be in charge of the engineering division, and **W. G. Jens** becomes general superintendent of construction.

**Earl R. Ernsberger,** president and general manager of the Southwestern Light & Power Company, was elected first vice-president of the Oklahoma Utilities Association at the quarterly meeting of the executive board of the association, Jan. 8, immediately after having been elected a member of the board. He fills the vacancies in both offices caused by the resignation of J. H. Buell of Tulsa, vice-president of the Oklahoma Power Company. Mr. Ernsberger has also been made president of the Chickasha Gas & Electric Company, recently transferred to the Southwestern Light & Power Company. Major Buell resigned because responsibilities as an officer of the Central & Southwest Utilities Company, with headquarters at Dallas, and of the Middle West Utilities Company, with headquarters at Chicago, require his presence outside of Oklahoma most of the time. All the companies mentioned belong to the Insull utilities group.

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## Charles Day New Chairman of Day & Zimmermann Board

Charles Day, who has become chairman of the board of directors of Day & Zimmermann, Inc., as announced in the Jan. 15 issue of the ELECTRICAL WORLD, devoted himself in his early professional life almost exclusively to industrial problems bearing upon manufacturing efficiency. In 1902 he became a member of the firm of Dodge & Day, consulting engineers, the name of which was changed subsequently to Day & Zimmermann, Inc., following the affiliation of John E. Zimmermann with the organization. Since the time when the activities of Day & Zimmermann extended into the public utility field, about 20 years ago, Mr. Day has become an authority on public service corporations, having served as an officer and director of numerous utility companies.

CHARLES DAY

Mr. Day has contributed numerous articles to the technical press and has lectured at Harvard, Columbia and Lehigh Universities. He is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the Franklin Institute and the Society for the Promotion of Engineering Education.

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**R. M. Houger** has been named general manager of the People's Wisconsin Hydro-Electric Corporation at Amery. This company, heretofore known as the Wisconsin Hydro-Electric Company, serves a score of communities in the north central part of that state and is now a part of the W. B. Foshay Company group.

**J. Hall Truman, Jr.,** formerly general commercial manager of the Eastern New Jersey Power Company, Asbury Park, N. J., has just been named general manager of the company to succeed J. E. Hill, recently resigned. Mr. Truman has been connected with that organization since last October, when he severed his connection with the Allentown division of the Pennsylvania Power & Light Company. After being graduated from the University of Illinois in 1911, Mr. Truman entered the employ of the Commonwealth Edison Company, Chicago, and spent several

years with the Insull properties in Illinois. He served in the World War and following its close engaged in public utility work in Ohio.

**A. J. Goedjen,** manager of the Menominee & Marinette Light & Traction Company's railway, electric and gas properties in the cities named, has been made manager of the northern division of the Wisconsin Public Service Corporation's operations under a new rearrangement of divisions which has been announced. Mr. Goedjen's supervision over the operation of the corporation's properties will be widened to include twelve more communities.

**M. A. Vreeland** has been appointed superintendent of the New Mexico Power Company, Santa Fe, to succeed A. J. Griffin, who recently resigned after 30 years' service with the company.

**R. M. Phelps,** formerly engaged in rate and development work in the commercial department of the Northwestern Public Service Company, Huron, S. D., has been appointed new-business manager of the Cumberland County Power & Light Company, Portland, Me. **Roy E. Holden** has been appointed sales manager of the company in charge of electrical merchandising throughout its entire territory. **D. M. Libby,** power sales engineer of the company, who recently succeeded H. Burgi, Jr., in that post, will report to the new-business manager.

## H. M. Beugler Appointed to New Position

Hugh M. Beugler, formerly vice-president of the Central Hudson Gas & Electric Company in charge of operation, engineering and construction, was named consulting engineer of the Central Hudson Gas & Electric Corporation at a recent organization meeting of the corporation. The board of directors of the corporation held its first meeting early this month, when the corporation, which succeeds the old Central Hudson Gas & Electric Company and its associated companies, was organized. Mr. Beugler is well qualified to act in the capacity of consultant engineer, having had a long record of activity not only with the Central Hudson system but also in other fields of endeavor before he joined the company in 1909.

His first affiliation in the industry was with the Thomson-Houston Company, where he worked on various assignments involving the design and construction of power plants, electric lighting systems and gas and water installations. After engaging in railway work at Ithaca, N. Y., he spent a year on special engineering and construction at Perth Amboy, N. J., and at Rome, N. Y. From 1901 to 1906 he served as general superintendent and chief engineer of the Elmira (N. Y.) Water, Light & Railroad Company. Following a year's association with Ford, Bacon & Davis in New York and a year's association with Day & Zimmermann in Philadelphia, he returned to the Elmira utility.

It was in 1909 that he entered the employ of the Central Hudson system as manager of the electric department of the Newburgh Light, Heat & Power Company. Two years later he became operating manager of the Central Hudson system of gas and electric companies with headquarters at Poughkeepsie, which position he retained until last year, when he became vice-president of the Central Hudson Gas & Electric Company in charge of operation, engineering and construction.

H. M. BEUGLER

## E. W. Allen New Vice-President of G. E. Company

E. W. Allen, who has been elected vice-president of the General Electric Company in charge of engineering, as announced in the Jan. 8 issue of the ELECTRICAL WORLD, was born in Buchanan, Va., in 1880. He was graduated from the Virginia Polytechnic Institute in 1900 with a B.S. degree in electrical engineering. Mr. Allen entered the employ of the General Electric Company in January, 1901, in the test department at Schenectady. On Dec. 1, 1902, he was assigned to the lighting engineering department, where he remained until the fall of 1911, when he was appointed engineer of the Chicago district.

E. W. ALLEN

On Sept. 1, 1913, in addition to his duties as district engineer, he was made assistant district manager. He entered military service in 1917 and served two years, returning to the company in April of 1919. He was appointed manager of the engineering department in April, 1924, which position he occupied until his recent election to the office he now holds.

# Obituary

**Dr. Ernst Heilbron,** who had been associated with the Allgemeine Elektricitäts-Gesellschaft for 35 years, died recently in Berlin at the age of 65. Dr. Heilbron had been considered an expert on electrical meters.

**George E. Dennis,** sales manager of the Twin State Gas & Electric Company, with headquarters at Boston, died Jan. 10 in that city. He was 32 years of age and had but recently assumed the duties of this post, succeeding Everett L. Olds.

**William H. Hodgins,** secretary of the Okonite Company, died after a brief illness on Jan. 7 at his home in Glen Ridge, N. J. Mr. Hodgins had been associated with the Okonite Company for more than 40 years and served for many years as a director in addition to his office as secretary. He had a wide circle of friends in the electrical field.

**Walter C. Weston,** up to two years ago a director of the Weston Electrical Instrument Company, Newark, N. J., died Jan. 15 at his home in East Orange, N. J., after a long illness. Dr. Edward Weston, his father, was the founder of the Weston Electrical Instrument Company, which was succeeded by the Weston Electrical Instrument Corporation, Dec. 29, 1924, at which time Walter C. Weston discontinued his association with the company and retired from business.

**James F. Beedle,** for many years manager of the Lundin Electric & Machine Company, Boston, died recently at Arlington, Mass., at the age of 58. Mr. Beedle was educated at the Massachusetts Institute of Technology and was employed by the Lundin company for about fifteen years, retiring two years ago on account of poor health. He was well known in the field of street-lighting standards design.

**Oscar E. Bulkeley,** superintendent of the board of water and electric light commissioners, Lansing, Mich., died Jan. 4. Mr. Bulkeley had been superintendent of the electric light and water systems of Lansing since 1920, when he transferred his interests to that city after engaging for some time in engineering work in Tennessee. He was a native of Oneida, Ill., and a graduate of Knox College at Galesburg and of the University of Illinois in civil engineering. Mr. Bulkeley was 42 years of age.

**Joseph Rockhill,** president of the General Insulate Company, Brooklyn, N. Y., died at his home in Brooklyn on Jan. 11. Mr. Rockhill was one of the pioneers in the molding of plastic materials in this country. For a long time he was an officer of the Electrose Manufacturing Company. Mr. Rockhill formed the General Insulate Company about 1905, occupying the office of president until his death. In that connection he worked with Dr. George Baekeland on the first commercial experiments with bakelite, and his was one of the first companies to engage actively in the molding of that compound.

# Commission Rulings

**Loans from Holding Company Applied to Operating Expenses Cannot Be Capitalized.**—Interest on unpaid operating expenses and the expenses themselves are not proper charges to fixed capital, but only money earned and invested in property, the Nebraska State Railway Commission declared in cutting down to $114,800 the application of the Nebraska City Water & Light Company for permission to issue $150,000 common stock. The Nebraska City Utilities Company, the holding company, had made advances of bond interest and other expense items totaling $179,851, upon which $39,500 had been paid. The commission said that the difference could be taken as a measure of the amount subject to capitalization. It found that the net additions to plant had been $114,785.

**Flat Rate Approved for Lighting at Resort on Property Under Development by Land Company.**—On the application of the Putnam Land Company, the Michigan Public Utilities Commission decreed that a flat rate for electric light service to resort cottages may be approved, notwithstanding the usual practice of the commission not to allow a flat rate, where the service will be given by a land company in connection with the development of its property, and where the number of consumers will be few in comparison with an ordinary utility business. The rate proposed and approved was $1 per month for each cottage or house with less than ten outlets and 25 cents additional for each additional five outlets or fraction thereof, such monthly charge to be made every month during the year and service to be rendered from dusk until fifteen minutes after midnight.

**Bearing of Transformer Size on Rural Rates.**—It has been held by the Wisconsin Railroad Commission in a case affecting the Garfield Electric Company that charges for rural electric service should vary in accordance with the size of the meter. The reasons for this decision were given as follows: (1) Rural service is characterized by a markedly larger amount of distribution system per customer than is urban service. In rural districts few customers can be served per mile of line, whereas in urban centers the greater density of population makes possible the service of several times as many consumers with an equal length of line. In urban territory a relatively large number of service connections may be made from a single transformer; in rural service the distance between consumers is usually such as to necessitate individual transformers or at least one transformer for but two or three customers. The investment per consumer is, therefore, unescapably greater in rural service. (2) Rural service undergoes large distribution losses, resulting in part from the greater length of rural lines as compared with urban lines and in part from the larger number of transformers and consequently greater transformer losses. Transformer core loss, which is substantially constant irrespective of the quantity of energy delivered, is often greater than kilowatt-hour consumption. A rural service charge truly related to the amount by which the cost of rural service exceeds that of urban service should be designed, not only to cover the excess fixed costs attributable to the greater investment per customer in rural service, but also to cover the excess distribution losses represented by the customer's transformer core loss.

**Rate Reduction Not to Be Construed As Penalizing Efficiency.**—The Maryland Public Service Commission in fixing rates for the Consolidated Gas, Electric Light & Power Company of Baltimore replied to a contention by the company that since it had voluntarily made a rate reduction aggregating $875,000, which was the amount of the savings it had effected through economies and advantageous contracts, any order for a further reduction would put a penalty on good and economical management, by asserting that it had no intention of penalizing efficiency and good management, for it realized that an efficient, well-managed corporation, able to prosper on rates that are no more than just and reasonable, is an asset to the community. The commission held, however, that it was its duty to study the trend of the earnings, and when the trend indicated an excessive return to reduce the rates. This was ordered because the trend indicated, in the commission's opinion, that the earnings would yield a return of more than 8 per cent.

**Commission Finds Fault with Advertisements Implying that Its Valuation Is Too Low.**—In a recent order the Oregon Public Service Commission, commenting on utilities and public relations, said: "We trust that advertisements for sale of bonds of public utilities in this state will not be burdened with misstatements or partial statements as to the financial condition of the utility. The entire truth concerning the results of operations of a utility is the only basis for the establishment of lasting, amicable public relations." This observation is understood to have been based on a practice said to have been indulged in by some concerns of acquiring possession of small public utility properties and closely following the acquisition with the issuance of bonds which are advertised as being secured by valuations amounting to nearly half again as much as the purchase price of the holdings. While, of course, the actual valuation figures are not contained in the bond advertisements referred to, the commission objects, particularly in instances where not more than 60 days have elapsed between the date of the engineers' findings and the notification of financing programs and in cases where the commission has allowed increases in rates for electric light and power service on the ground that the utilities were operating in isolated and thinly populated territories with opportunities for expansion rather remote.

# Recent Court Decisions

**Maryland Commission Cannot Permit Sale of Municipal Plant to Private Company.**—The Maryland Court of Appeals has handed down an opinion to the effect that the Public Service Commission of the state acted beyond its jurisdiction in authorizing the Mayor and City Council of Snow Hill to sell the plant of the Snow Hill Electric Light & Power Company, municipally owned, to the Worcester Electric Company. Suggesting that the Snow Hill authorities seek a remedy from the Legislature, the court declared that it could find nothing that gave the commission jurisdiction to authorize the sale by a municipality of public property.

**Jury May Find Negligence Against Electric Company for Explosion of Switch Not Accepted by Plaintiff's Employer.**—In Kingan vs. Duquesne Light Company suit was brought for damages because of injury to a plant engineer when a switch he had just thrown exploded. The company claimed that the accident was due to the faulty way in which the man operated the switch and asked for a directed verdict, but the Supreme Court of Pennsylvania held that the question of negligence was for the jury to decide. An instruction to find for the defendant if the switch had been accepted by the employer of the man injured was held to be proper. This was also a question of fact and for the jury. (135 At. 253.)*

**Power Company Negligent Where Boy Climbing Tree Was Injured by Charged Guy Wire.**—Although reducing the damages awarded from $30,000 to $17,500, the Supreme Court of Missouri found the Kansas City Light & Power Company (sued by Shannon) responsible for serious injury to a boy who in climbing a tree came into contact with a broken guy wire which had become charged with electricity owing to the absence of insulation on a 2,300-volt line running through the tree. The court held that negligence by the company in permitting the contact was established, even though the main wire was 30 ft. above the ground; nor was the fact that the injury occurred on the land of a third party an exculpatory fact. (287 S. W. 1031.)

**Entire Record in Commission Proceeding Must Be Examined When Court Reversal Is Sought.**—Reviewing a bus-line decision of the Ohio Public Utilities Commission (Lykins vs. Commission), the Supreme Court of Ohio announced that, although commission proceedings are informal in character, yet in reviewing an order said to be against the weight of evidence or unlawful or unreasonable the court would examine the entire record to determine whether the order was based upon sufficient evidence received under the established and recognized rules. (154 N. E. 249.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Financial and Corporate

## Bonds Feature Markets

**Trading in Junior Securities More or Less Restricted and a Number of Losses Are Recorded**

CHANGING levels in long-time money rates, as well as the gradually improving position of the power and light industry, have combined to increase demand steadily for the better-grade bonds. The total of new utility issues is more than $200,000,000 greater than in 1925, yet there is no difficulty found in marketing new issues. The seasoned issues, moreover, have risen appreciably over the past two years.

Concentration upon the bond end of the market has led to much speculation concerning the probable effect of this on junior securities. Normally such a movement reaches the point where investors begin to lose interest owing to declining yield. Such a change of viewpoint is not anticipated, in any event, until after the absorption of the present accumulated funds for investment, which are larger than ever before. The total volume of financing last year, including junior and senior financing, was in excess of $7,000,000,000, the largest total ever reached except in the war period.

For the most part, common and preferred issues have been weak and generally inactive. Losses were recorded in the case of Edison Electric of Boston, Southeastern Power & Light, Middle West Utilities and other common stocks, while some gains took place during the week, notably in Pacific Gas & Electric and Columbia Gas & Electric. The index of fifteen representative common stocks compiled by the ELECTRICAL WORLD dropped two points to 94, the lowest point since November.

## Hulswit Heads New Utility Organization

The American Commonwealths Power Corporation has been organized to acquire through exchange of securities the common capital stock of the Community Power & Light Company and substantially all the public utility investments owned by the American States Securities Corporation. The Community Power & Light Company controls and operates properties supplying electricity, gas or manufactured ice to 136 communities in Missouri, Kansas, Arkansas, Texas and New Mexico and serves about 286,000 persons. The American States Securities Corporation was formed in 1925 by Frank T. Hulswit, who will be the president of the new organization. David A. Belden, president of the Community Power & Light Company, will remain as chief executive of that company and will become vice-president and general manager of the American Commonwealths Power Corporation. The directorate is composed of H. F. McConnell of New York, Clayton E. Platt of Philadelphia, H. L. Nason of Boston, William L. Ross and Herbert L. Nichols of Chicago, E. J. Costigan and David A. Belden of St. Louis and Russell J. Boyle of Grand Rapids.

The American Commonwealths Power Corporation will be capitalized at $3,500,000 in 6 per cent 25-year gold debentures, 13,800 shares of no-par $7 series second preferred stock and 112,000 shares of no-par full-voting common stock. Upon completion of the proposed transaction, the American States Securities Corporation will own all the common stock of the American Commonwealths Power Corporation and will have outstanding about 969,124 shares of class A and 542,277 shares of class B full-voting stock.

## Company Reports

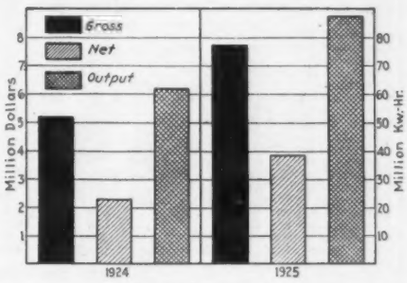
The following statements of earnings have been issued by electric light and power companies:

| Name of Company | Gross Earnings Twelve Months Ended Nov. 30 1926 | 1925 |
|---|---|---|
| Columbia Gas & Electric.... | $92,210,312 | ..... |
| Fort Worth Power & Light.. | 2,871,401 | $2,835,203 |
| Nebraska Power..... | 4,365,989 | 4,149,782 |
| Pacific Power & Light..... | 3,745,490 | 3,487,042 |
| Texas Power & Light..... | 7,575,571 | 6,826,201 |
| West Penn Electric..... | 34,101,919 | 31,222,132 |

# Costly Duplication in Indianapolis Ends

**Merger of Indianapolis Light & Heat Company with Merchants' Heat & Light Company Finally Allowed by the State Public Service Commission**

REPEATED attempts over a period of years on the part of the two competing utility companies in Indianapolis to obtain sanction to merge their interests and terminate a long period of expensive duplication of effort have at last been successful. On Jan. 8 the Public Service Commission of Indiana issued an order authorizing the Indianapolis Power & Light Company, a subsidiary of the Utilities Power & Light Corporation, to acquire the properties of the Indianapolis Light & Heat Company and the Merchants' Heat & Light Company. Under the order, permission was given to issue the following securities: (a) $30,000,000 first mortgage gold bonds, series "A," dated Jan. 1, 1927, payable January, 1967, bearing interest at 5 per cent per annum and subject to redemption at not exceeding 105 per cent; (b) 120,000 shares of 6½ per cent cumulative preferred stock having a par value of $100 per share and subject to redemption at not exceeding 115 per cent; (c) 600,000 shares of common stock of no par value. With this action the Indiana commission brings to a close a period of costly competition and inaugurates a new period of improved service at reduced cost.




REVENUE AND OUTPUT OF UTILITIES POWER & LIGHT CORPORATION

The Utilities Power & Light Corporation now controls the entire electric light and power industry in the Indianapolis metropolitan area. The population served is at present about 400,000, the customers number 125,000, and the gross income is about $8,500,000. Of the merged companies, the Utilities Power & Light Company controlled the Indianapolis Light & Heat Company and the Insull interests owned the Merchants' Heat & Light Company. With the merger the Insull interests retire from the electric light and heat industry in Indianapolis and Marion County, Ind.

### SAVING PASSED ON TO CONSUMERS

It is estimated by the engineers of the merged companies that their consolidation will result in a saving in operating costs of $348,000 per year. This saving furnishes an excellent illustration of the economic advantages of unified control of the production of electric light and power. Such savings in the long run always benefit those who use the commodity produced. In the present instance the benefit to the consumers will be immediate and substantial. H. L. Clarke, on behalf of the merged companies, offered a new rate schedule for domestic consumers affecting 60,000 customers and resulting in an estimated annual saving to them of $315,000. The new schedule provides for domestic rates ranging from 6.75 cents net per kilowatt-hour as the highest down to 3.15 cents net per kilowatt-hour for larger consumption. Moreover, consumers of large power have been given a reduction of 5 per cent from the previously existing rates, which were very low. It is confidently expected that these new rates will enable those of small incomes, as well as the more affluent, to make more general use of the electrical appliances that are adding enormously to the com-

fort of American homes. The reduction of large power rates, added to the transportation facilities enjoyed by Indianapolis and numerous other advantages, will help to make it a still greater industrial center.

### STRANGE PSYCHOLOGY SHOWN IN OPPOSITION TO THE MERGER

The merger presented the occasion for an exhibition of strange psychology. In spite of its obvious and admitted advantages, the reduction in rates offered and guarantees for the future, numerous individuals and organizations opposed it and heckled the Public Service Commission for several weeks. It was contended that the commission did not have jurisdiction, that it had forfeited its rights because it had not made a valuation of the properties, that it must wait until private and unofficial persons and groups of persons had made valuations, and so forth. With admirable patience the commission permitted every one who cared to do so to have his moment in the public eye; then it made use of the powers conferred upon it by law and issued an order that will be of great immediate benefit to Indianapolis and of still greater benefit in the future, for the evils that have been cured would have grown as time went on.

The heckling of the Indiana Public Service Commission and its effective action throw a strong light upon the question of the advisability of the creation of commissions by law to have supervision over public utilities. The alternative seems to be a commission or local political control. Commissions may sometimes err, they might even betray the interests of the people or levy tribute on the utilities, but as a rule they will be composed of fair men.

The fact that authority usually is localized in a few who can be called to account is a safeguard against wrong actions. The chief difficulty is to get men with backbone who will do their duty regardless of mob attacks. On the other hand, local political control is subject to every evil, as is illustrated by the transportation systems of many cities. Unscrupulous daily papers can sway an uninformed public, peanut politicians can deliver or take away for a consideration, cheap publicity seekers can champion the cause of "the people," and in the meantime the harassed utility hesitates to make the investments necessary to provide the highest class of service.

## New Capital Issues

The thirty-million-dollar issue of first mortgage gold bonds, series A, of the Indianapolis Power & Light Company, which was authorized last week by the Indiana Public Service Commission, was offered to the investing public on Tuesday of the past week at 98 and accrued interest, to yield over 5.13 per cent. These 5 per cent gold bonds, dated Jan. 1, 1927, and maturing Jan. 1, 1957, will be secured by a direct first mortgage on all of the fixed properties presently to be acquired by the company. Details covering the formation of the company and its capital set-up appear elsewhere in this section.

First mortgage 5 per cent gold bonds, series A, of the Southwestern Gas & Electric Company were offered at 96 and interest, yielding over 5.25 per cent, a piece of financing involving a total of $12,500,000. These bonds, in the opinion of counsel, will be a direct obligation of the company and will be secured by an absolute first mortgage on all of the permanent property, rights and franchises of the company now owned and on all such property hereafter acquired on account of which bonds are issuable under the mortgage.

## Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless o therwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Tuesday Jan. 18 | Low 1927 | High 1927 |
|---|---|---|---|
| **ABITIBI PWR. & PAPER, 4% com.—no par** | k 85 | 70½* | 98* |
| Adirondack Pwr. & Lt.—7% pf. | 104½ | 101* | 108½* |
| Adirondack Pwr. & Lt.—8% pf. | 111 | 101* | 115* |
| Ala. Pwr., 7% pf. | 108 | 108 | 109½ |
| Allis-Chalmers Mfg., 7% pf. | k111 | 105* | 111½* |
| Allis-Chalmers Mfg., 6% com. | 91 | 88½ | 90 |
| Aluminum Co. of Amer., com. | 71½ | 70½ | 72 |
| Aluminum Co. of Amer., 6% pf. | 101 | 98½* | 103½* |
| Amer. & Foreign Pwr., pf. 25% pd. | m110 | .... | .... |
| Amer. & Foreign Pwr., 7% pf.—no par | 89 | 88½ | 89½ |
| Amer. & Foreign Pwr., com.—no par. | 20½ | 20 | 23 |
| Amer. Bosch Magneto, com.—no par | 15½ | 15½ | 17½ |
| Amer. Brown Boveri Elec† | 38 | 38 | 39 |
| Amer. Brown Boveri Elec., pf. $7 | 97½ | 96½ | 97½ |
| Amer. Gas & Elec., 6% pf.—no par | 96½ | 91* | 98½* |
| Amer. Gas & Elec., com.†—no par | 71½ | 69 | 100 |
| Amer. Lt. & Trac., 6% pf. | 96½ | 96½ | 97½ |
| Amer. Lt. & Trac., com.† | 229 | 224 | 230 |
| Amer. Pwr. & Lt., 6% pf. | 98 | 97 | 98 |
| Amer. Pwr. & Lt., com.†—no par | 59½ | 59½ | 61½ |
| Amer. Pub. Serv., 7% pf. | k 96 | 92* | 97½* |
| Amer. Pub. Serv., com.† | k 50 | 45* | 80* |
| Amer. Pub. Utilities, 7% pr. pf. | 74 | 73* | 89* |
| Amer. Pub. Utilities, 7% ptc. pf. | 86 | 86* | 95* |
| Amer. Pub. Utilities, com. | m66 | 68* | 82* |
| Amer. States Sec., A | 4 | 2* | 9½* |
| Amer. States Sec., B | 4 | 1½* | 5½* |
| Amer. Superpwr., $6 D f.—25 | 27½ | 26½ | 27½ |
| Amer. Superpwr., 7% pf. | l 94 | .... | .... |
| Amer. Superpwr., Class A†—no par. | 28½ | 27½ | 28½ |
| Amer. Superpwr., Class B†—no par. | 28½ | 28½ | 29½ |
| Amer. Wtr. Wks. & Elec., 7% pf. | k108 | 101 | 108½ |
| Amer. W. W. & E., com. $1.20—20. | 65½ | 62½ | 67 |
| Anaconda Copper Cp. $3 | 47½ | 47½ | 49½ |
| Appalachian Electric Pwr., 7% pf. | k 99 | 90* | 101* |
| Appalachian Elec. Pwr., 2d pf., 7% | k 98 | 99* | 102* |
| Appalachian Elec. Pwr., com. | m78 | .... | .... |
| Arizona Pwr., 7% pf. | 74 | 60* | 82* |
| Arizona Pwr., com. | 24½ | 22 | 24½ |
| Arkansas Cent. Pwr., pf.—$7 no par. | k101 | 99* | 107* |
| Arkansas Lt. & Pwr., 7% pf. | 102 | 96* | 104* |
| Arkansas Lt. & Pwr., com. | .... | 110* | 115* |
| Assoc. Gas & Elec., $3.50—50 | 50½ | .... | .... |
| Assoc. Gas & Elec., pf.—$6—no par. | 86½ | 79½* | 86½* |
| Assoc. G.&E., Class A, $2.50—no par | 35½ | 35 | 36½ |
| **BABCOCK & WILCOX, 7% com.** | 116 | 117* | 151* |
| Binghamton L., H. & P., $6 pf. | k 91 | 90* | 95* |
| Birmingham Elec., pf.—$7—no par. | 105 | 101* | 108* |
| Blackstone Valley G. & E., $6 pf. | k102 | 103* | 106* |
| Blackstone Valley Gas & Elec., 10% com.—50 | k104 | 100½* | 106* |
| Blaw-Knox, com.† | t 70 | 45* | 80* |
| Brazilian Trac., Lt. & Pwr., com.† | f106½ | .... | .... |
| Broad River Pwr., 7% pf. | 99½ | 93* | 98* |
| Brooklyn Edison, 8% com. | 151½ | 150½ | 154½ |
| Buffalo, Niagara & East. Pwr., pf.—25 | l 25½ | .... | .... |
| Buffalo, Niagara & East. Pwr., com.†—no par | l 28 | .... | .... |
| **CALIFORNIA ELEC. GENERATING, 6% pf.** | k 93 | 89* | 95* |
| California Ry. & Pwr., 7% pf. | k125 | 88* | 130* |
| Carolina Pwr. & Lt., pf.—$7—no par | 107 | 102* | 108½* |
| Central & S.W. Util., 7% pf.—no par | a 95 | 89½* | 96½* |
| Central & S.W. Util., pr. In. $7 pf.—no par | a 99½ | 93* | 100* |
| Central Ariz. Lt. & Pwr., 8% pf. | 109 | 103* | 108* |
| Central Ark. Ry. & Lt., 7% pf. | 101 | 99* | 101* |
| Central Ill. Pub. Serv., 6% pf. | k 86 | 89* | 91* |
| Central Ind. Pwr., 7% pf. | k 85½ | 84½* | 93½* |
| Central Pwr. Lt., 7% pf. | 99 | 94* | 103½* |
| Central States Elec., 7% pf. | 90 | 91* | 97* |
| Central States Elec., com.† | m200 | 200* | 230* |
| Century Elec., 6% com. | m117 | 110* | 117* |
| Chicago Fuse Mfg., com.—$2.50 no par | m 30½ | 30* | 35* |
| Cincinnati Gas & Elec., 5% com. | q 94½ | 93½* | 94½* |
| Cities Service, 6% pf. | l 91½ | 91½ | 92½ |
| Cities Service, pf. B—10 | l 8½ | 8½ | 8½ |
| Cities Service, pf. BB—100 | l 82 | 82 | 82½ |
| Cities Service, com.—20 | l 51½ | 50½ | 51½ |
| Cities Service, Bks. Shrs.—10 | l 25½ | 25 | 25½ |
| Clarion River Pwr., 8% pf. | k 95 | 93* | 95* |
| Cleveland Elec. Illg., 6% pf. | 108 | 103* | 109* |
| Cleveland Elec. Illg., 10% com. | 300 | 240* | 310* |
| Colorado Pwr., 7% pf. | k 95 | 96* | 97* |
| Columbia Gas & Elec., 6% pf. | 101½ | 100½ | 101½ |
| Columbia G. & E. com. $2.60—no par | 91½ | 88½ | 91½ |
| Columbia Ry., Gas & Elec., 6% pf. | k 94 | 65* | 90* |
| Columbus Elec. & Pwr., 2d. pf. | 103 | .... | .... |
| Columbus Elec. & Pwr., 9% com. | 55 | .... | .... |
| Columbus Ry., Pwr. & Lt., 6%, 1st pf. | 98 | 98* | 99½* |
| Columbus Ry., Pwr. & Lt., 6½% pf. B | 96½ | 92* | 97* |
| Columbus Ry., P. & L., com.—no par | 75 | 70* | 85* |
| Commonwealth Edison, 8% com. | a140½ | 135½* | 145* |
| Commonwealth Pwr., 6% pf. | 92½ | 91½ | 93 |
| Commonw'th Pwr., $2, com.—no par | 44½ | 42½ | 44½ |
| Conn. Lt. & Pwr., 8% pf. | 118 | 117* | 121* |
| Conn. Lt. & Pwr., 7% pf. | 118 | 108* | 113* |
| Cons. Gas of N. Y., pf.†—50 | 59 | 57* | 62½* |
| Cons. Gas of N. Y., com. $5—no par. | 105½ | 105 | 109½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf. | k105 | 102 | 107½ |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf. | e111½ | 108½* | 112½* |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf. | k 93 | 109* | 115* |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf. | e114 | 124* | 128½* |
| Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $2.50—no par. | e 52 | 45* | 57½* |
| Consolidated Pwr. & Lt., 7% pf. | 106 | 100* | 107* |
| Consumers Pwr., 6% pf. | 99½ | 95* | 101½* |
| Consumers Pwr., 6 6% pf. | 103½ | 101½* | 106* |
| Continental Gas & Elec., 7% ptc. pf. | 104 | 96* | 109½* |
| Continental Gas & Elec., 7% pr. pf. | 101 | 95½* | 101½* |
| Conti. G. & E. com. $4.40—no par. | k203 | 85* | 210* |
| Crocker Wheeler, com.† | 26 | 14* | 26* |
| Crocker Wheeler, 7% pf. | k 93 | 50* | 70* |
| **DALLAS PWR. & LT., 7% pf.** | 107 | 102* | 110* |
| Dayton Pwr. & Lt., 6% pf. | 101¾ | 95* | 100* |
| Detroit Edison, 8% com. | 135½ | 134½ | 136 |
| Dubilier Condenser, com.—no par. | 3½ | 4 | 4 |
| Dubuque Elec., 6% pf. | k 93 | 93* | 98½* |
| Duquesne Lt., 7% pf. | 115½ | 115½ | 116½ |
| **EASTERN NEW YORK UTIL., $7 pf.** | 102 | 101 | 103 |
| Eastern New York Util. com. | k 65 | 70* | 75* |
| Eastern States Pwr., $7, com. | 10 | 12* | 32½* |
| Eastern States Pwr., pf. | 94 | 89* | 95* |
| East. Tex. Elec., 7% pf. | 105 | 100* | 107* |
| East. Tex. Elec., com. $5—no par. | 75 | 70* | 80* |
| Edison Elec. of Boston, 12% com. | d222½ | 207* | 250* |
| El Paso Elec., com. $5—no par. | 100 | 70 | 102 |
| El Paso Elec., 7% pf. | 103 | 102* | 106½* |
| Elec. Bond & Share, 6% pf. | l108½ | 107½ | 109 |
| Elec. Bd. & Sh. Sec., com. $1—no par | l 69 | 70 | 72½ |
| Electric Household Util.† | a 11½ | 11½* | 25* |
| Elec. Investors, 6% pf.—no par. | 91 | 87* | 95* |
| Elec. Investors, com.†—no par. | 35½ | 34½ | 35½ |
| Elec. Investors, 10% pd. receipts. | 20 | 12* | 56* |
| Elec. Pwr. & Lt., ctfs. pf. | 96½ | 96 | 96½ |
| Elec. Pwr. & Lt., ctfs., 40% pd. | k104½ | 99½* | 115* |
| Elec. Pwr. & Lt., ctfs, full pd. | k104½ | 102½* | 110½* |
| Elec. Pwr. & Lt., ctfs., com.—no par. | 17 | 17 | 18½ |
| Elec. Refrig. cap.† | 33½ | 32½ | 37 |
| Elec. Ry. Securities, com.—no par | 8 | 48½* | 10* |
| Elec. St. Battery com. $5.25—no par | 77 | 75½ | 79½ |
| Elmira Wtr., Lt. & R.R., 7% pf. | 100 | 97½* | 101½* |
| Emerson Elec., pf. | m105 | 101* | 105* |
| Empire Pwr., A $6 | 26½ | 26½ | 27½ |
| Engr. Pub. Serv., $7 pf.—no par. | 96½ | 93½ | 97 |
| Engr. Pub. Serv., com. $7—no par. | 22½ | 21½ | 24 |
| Eureka Vacuum Cleaner, com. $4—no par. | 64 | 63 | 67½ |
| **FAIRBANKS MORSE, 7% pf.** | k107 | 106½* | 115* |
| F.-M., com.—$2.60—no par. | k 42½ | 37½* | 59½* |
| Federal Lt. & Trac., com.† | 39½ | 37½ | 42½ |
| Federal Lt. & Trac., pf. $6 | k 91 | 86* | 94* |
| Ft. Worth Pwr. & Lt., 7% pf. | l108 | 109 | 109 |
| **GALVESTON-HOUSTON ELEC. 6% pf.** | 67 | 65* | 70* |
| Galveston-Houston Elec., com. | 26½ | 26 | 26½ |
| Gen. Elec., 8% com. | 84½ | 82½ | 85½ |
| Gen. Elec., special—10 | 11½ | 11½ | 11½ |
| Gen. Gas & Elec. (Del.) com. A. $1.50—no par | k 41½ | 34* | 59* |
| Gen. G.&E. (Del.) com. B—no par. | m 42 | 36* | 48½* |
| Gen. G.&E. (Del.) pf. A. $8—no par. | k114 | 105½* | 113* |
| Gen. G.&E. (Del.) pf. A $7—no par. | k100½ | 95* | 100* |
| Gen G.& E. (Del.) pf. B$7 | k 96 | 92½* | 96* |
| Gen. Pub. Serv., $7 pf. | k103 | 102* | 106* |
| Gen. Pub. Serv., com. | k 12 | 11* | 16½* |
| Ga. Lt., Pwr. & Rys., 6% pf. | 89 | 82* | 98* |
| Ga. Lt., Pwr., & Rys., com. | m 60 | 65* | 80* |
| Ga. Ry. & Pwr., 8% pf. | k118 | 112* | 122* |
| Ga. Ry. & Pwr., 7% pf. | 105½ | 100½* | 108½* |
| Ga. Ry. & Pwr., 4% pf. | m119 | .... | .... |
| Ga. Ry. & Pwr., 4% com. | 120 | .... | .... |
| Gt. Western Pwr., 7% pf. | h102 | .... | .... |
| **IDAHO PWR., 7% pf.** | 104½ | 103* | 106* |
| Ill. No. Utilities, 6% pf. | k 88 | 88* | 92* |
| Ill. Pwr. & Lt., 7% pf. | 99½ | 96½ | 100½ |
| Ingersoll Rand com. $8 | k 92 | 80½* | 104* |
| Int. Combus. Engr., com. $2—no par | 46½ | 45½ | 49½ |
| Int. Util., Class A—$3.50—no par. | k 28½ | 24* | 39* |
| Int. Utilities, Class B—no par. | 4½ | 3 | 5½ |
| Interstate Pwr., pf.—$7—no par. | 92 | 90* | 98* |
| Interstate Pub. Serv., 7% pf. | 96½ | 96½* | 99½* |
| Iowa Ry. & Lt., 7% pf. | k 96 | 98* | 100* |
| **JERSEY CENTRAL PWR. & LT., 7% pf.** | 97 | 94* | 98½* |
| Jersey Cent. Pwr. & Lt., 7% ptc. pf. | 107 | 95½* | 112* |
| Jersey Cen. Pwr. & Lt., com.—no par | k 25 | 25* | 50* |
| Johns-Manville, com.†—no par. | 57½ | 57½ | 61½ |

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Franisco; iPittsburgh; jWashington. kBid price Saturday, Jan. 15. lBid price Wednesday, Jan. 19. mLatest quotations available. *1926. †Dividend rate variable.

## Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

| Companies | Bid Price Tuesday Jan. 18 | Low 1927 | High 1927 |
|---|---|---|---|
| **KANSAS CITY PWR. & LT. pf.$7** | £113 | 107½* | 115* |
| Kansas Gas & Elec., 7% pf. | 102½ | 101* | 105* |
| Kentucky Hydro-Elec., 7% pf. | *a* 94½ | 91½* | 95½* |
| Kentucky Sec.,6% pf. | 82 | 75* | 85* |
| Kentucky Sec., 5% com. | £108 | 90* | 108* |
| Kentucky Utilities, 6% pf. | £95 | 90* | 96½* |
| Keystone Pwr. & Lt., 7% pf. | £97 | 95* | 98½* |
| **LACLEDE GAS LT., 8% com.** | £176 | 146* | 196½* |
| Lehigh Pwr. Sec., com.—no par. | 17 | 15½ | 18 |
| Long Island Ltg., 7% pf. | 107½ | 105* | 112* |
| Long Island Ltg., com. $2—no par. | 145 | 120 | 155 |
| Los Angeles Gas & Elec., 6% pf. | 99 | 95½* | 100* |
| Louisville Gas & Elec., cl. A. $1.75 | £ 25 | 22½* | 26½* |
| **MAN. ELEC. SUPPLY, cap. $4.25 —no par** | 54½ | 54½ | 57½ |
| Manila Elec., com.†—no par. | £ 38½ | 27½* | 45½* |
| Maytag Mfg., com. .50—no par. | 26 | 23½ | 26 |
| Memphis P. & L., pf.—$7—no par | £106½ | 103* | 110* |
| Metropolitan Ed., pf.—$6—no par. | 95 | 91½* | 98* |
| Metropolitan Ed., pf.—$7—no par. | 103½ | 102* | 108* |
| Metropolitan Ed., com. $5—no par. | £ 60 | 45* | 60* |
| Middle West Utilities, 7% pf. | *a*107½ | 97½ | 111½* |
| Middle West Util., 7% pr. lien pf. | *a*118½ | 106½* | 123½* |
| Middle West Util., com. $6—no par | *a*111½ | 108* | 135* |
| Midland Utilities, pr. in. 7% pf. | *a*107½ | 97* | 111½* |
| Midland Utilities, 7% pf. A. | *a*97 | 96* | 99½* |
| Milwaukee Elec. Ry. & Lt., 7% pf. | £101 | 100* | 103* |
| Milwaukee Elec. Ry. & Lt., 6% pf. | £ 98½ | 87* | 100* |
| Minn. Pwr. & Lt., 7% pf. | £104 | 100 | 106 |
| Miss. Pwr. & Lt., $8 pf. | 106 | 102* | 107½* |
| Miss. River Pwr., 6% pf. | 94 | 93* | 96* |
| Miss. River Pwr., com. | 62 | .... | .... |
| Mohawk Hudson Pwr., 1st pf.—$7 —no par | 104½ | 104 | 105 |
| Mohawk Hudson Pwr., 2d pf.—$7 —no par | 99 | 90* | 102* |
| Mohawk Hudson Pwr., com.—no par | *m* 21½ | 20½* | 23½* |
| Montana Pwr., 7% pf. | *m*117½ | 112½* | 119½* |
| Montana Pwr., 4% com. | £ 82½ | 69½* | 86½* |
| Montreal Pwr., 7% com. | 82½ | 81½ | 83½ |
| Mountain States Pwr., 7% pf. | 96 | 97* | 102* |
| Mountain States pwr., com.† | 18 | .... | .... |
| **NASSAU & SUFFOLK LTG., 7% pf.** | 98 | 93* | 101* |
| National Carbon, 8% pf. | *m*130 | 124* | 130* |
| National Elec. Pwr., A† | 24½ | 23½ | 24½ |
| National Elec. Pwr., 7% pf. | *a* 95½ | 92* | 96½* |
| National Lt., Ht. & Pwr., com. | 24 | 22* | 25* |
| National, Light, Ht. & Pwr., 6% pf. | 70 | 71* | 73* |
| National Pwr. & Lt., pf.—$7—no par | 102½ | 101½ | 103 |
| National Pwr. & Lt., com.†—no par. | 21½ | 20½ | 22 |
| National Pub. Serv., 7% pf. | 94 | 91 | 94 |
| National Pub. Serv., 7% ptc. pf. | 107 | 96* | 112* |
| National Pub. Serv., A com. $1.60— no par | £ 20½ | 15½* | 24* |
| National Pub. Serv., B com.—no par | 15½ | 14 | 15½ |
| Nebraska Pwr., 7% pf. | £107 | 107½ | 108½ |
| Nevada-Calif. Elec., com. | £ 26½ | 18½* | 44½* |
| New Brunswick Pwr., 7% pf. | 58 | 30* | 60* |
| New Eng. Pub. Serv., pr. in. pf. $7.. | 100 | 96 | 98½ |
| New Eng. Pub. Serv., pf. $7. | £93 | 95½* | 97* |
| New Orleans Pub. Serv.—7% pf. | 102 | 100* | 105* |
| N. Y. & Queens Elec. Lt. & Pwr., 5% pf. | 90 | 89* | 95* |
| N. Y. Central Elec., 7% pf. | 100 | 98* | 100* |
| Newport News & Hampton Ry., Gas & Elec., 5% com. | 109 | 98* | 112* |
| Newport News & Hampton Ry., Gas & Elec., 7% pf. | 109 | 98* | 114* |
| Niagara Falls Pwr., 7% pf.—25. | £ 28½ | 27½* | 29½* |
| Niagara, Lock. & Ont. Pwr., 7% pf. | £11 | 110* | 111½* |
| No. Amer., 6% pf.—50. | 50½ | 50 | 51 |
| No. Amer., com.—10. | 49 | 45½ | 49 |
| No. Amer. Edison, $6 pf.—no par. | 97½ | 96½ | 98 |
| No. Amer. Lt. & Pwr., 7% pf. | 101 | 88* | 104* |
| No. Caro. Pub. Serv., pf.—$7—no par | 94 | 89* | 96* |
| Northeastern Pwr., com. | 18 | 16½ | 18½ |
| No. Indiana Gas & Elec., 7% pf. A. | 101 | 98* | 103½* |
| No. N. Y. Utilities, 7% pf. | 104 | 103* | 105½* |
| No. Ohio Pwr., com.—no par. | 11 | 9½ | 11 |
| No. Ohio Trac. & Lt., 6% pf. | £76 | 78* | 81* |
| No. Ohio Trac. & Lt., 7% pf. | £ 90 | 88* | 96* |
| No. Ont. Lt. & Pwr., 6% pf. | £ 85½ | 75* | 88½* |
| No. Ont. Lt. & Pwr., 4% com. | 74 | 73* | 78* |
| No. States Pwr., 7% pf. | 102 | 99½* | 103½* |
| No. States Pwr., 8% com. | 110½ | 109½ | 111 |
| No. Texas Elec., 6% pf. | 58 | 48* | 65* |
| No. Texas Elec., 4% com. | 25 | 15* | 45* |
| **OHIO BRASS, com. B $4—no par.** | 79 | 76 | 79 |
| Ohio Brass, 6% pf. | £100 | 98* | 101* |
| Ohio Gas & Elec., 7% pf. | 94 | 90* | 95* |
| Ohio Pwr., 6% pf. | 96½ | 90* | 97* |
| Ohio Pub. Serv., 6% pf. | *a*94½ | 94½ | 94½ |
| Ohio Pub. Serv., 7% pf. | £104 | 103½ | 104 |
| Ohio River Edison, 7% pf. | 103 | 98½* | 105* |
| Oklahoma Gas & Elec., pf. | 96 | .... | .... |
| **PACIFIC GAS & ELEC., 6% pf.** | £100½ | 99* | 102½* |
| Pacific Gas & Elec., 8% new com. | 32½ | 32½ | 32½ |
| Pacific Pwr. & Lt., 7% pf. | £102½ | 102½ | 102½ |
| Parr Shoals Pwr., 6% pf. | 92 | 90* | 97½* |
| Penn Cent. Lt. & Pwr., $5 pf.—no par. | *c* 71½ | 70½* | 91* |
| Penn-Ohio Edison, 7% pf. | 98½ | 98 | 99 |
| Penn-Ohio Elec., 7% pf. | 95 | 93* | 96* |
| Penn-Ohio Pwr. & Lt., 7% pf. | 98 | 94* | 100* |
| Penn-Ohio Pwr. & Lt., 8% pf. | 109 | 100* | 111* |
| Penn Pwr. & Lt.—$7—no par. | £106½ | 105½ | 106½ |
| Penn Pub. Serv., 7% pf. | 103 | 96* | 103* |
| Penn Pub. Serv., 6% pf. | 87 | 85* | 90* |
| Penn Wtr. & Pwr., 8% com. | 176½ | 175½ | 180 |
| Phila. Co., 6% pf.—50. | 50½ | 50 | 50½ |
| Phila. Co., com.—50. | 85½ | 85½ | 87 |
| Phila. Elec., 8% com.—25. | *c* 53½ | 41½* | 67½* |
| Pittsburgh Utilities, 7% pf.—10. | *m*19½ | 14½* | 20½* |
| Portland Elec. Pwr., 7% pf. | 98 | 97* | 101* |
| Portland Elec. Pwr., 6% pf. | 84 | 71* | 87* |
| Portland Elec. Pwr., 6% 2d pf. | 70 | 71* | 75* |
| Portland Elec. Pwr., com. | 29 | 26* | 48* |
| Potomac Elec. Pwr., pf. | £107½ | .... | .... |
| Pwr. Corp. of N. Y., com. $1—no par | *m*79 | 77½* | 90½* |
| Pwr. Sec., pf.—no par. | £ 37 | 10* | 39* |
| Pwr. Sec., com.—no par. | £ 5 | 4* | 13* |
| Public Serv. of Colorado, 7% pf. | £ 99 | 99 | 99 |
| Pub. Serv. of N. J., 7% pf. | £110 | 103½* | 110* |
| Pub. Serv. of N. J., 8% pf. | £125 | 115* | 124½* |
| P. S. of N. J., $5 com.—no par. | 32½ | 32 | 32½ |
| Pub. Serv. of No. Ill., 6% pf. | *a*104 | 99½* | 106* |
| Public Serv. of No. Ill., 7% pf. | *a*114 | 112* | 116½* |
| P. S. of No. Ill., com. $8—no par. | *a*133 | 121* | 140* |
| Pub. Serv. of No. Ill., 8% com. | *a*132½ | 128* | 143* |
| Pub. Serv. of Okla., 7% pf. | 99 | 92* | 100* |
| Pub. Serv. Elec. & Gas, 6% pf. | 102½ | 102 | 102½ |
| Pub. Serv. Elec. Pwr., 7% pf. | £114 | 106* | 114* |
| Puget Sound Pwr. & Lt., 7% pf. | 103 | 103* | 108* |
| Puget Sound Pwr. & Lt., 6% pf. | 83 | 82* | 84½* |
| Puget Sound Pwr. & Lt., com. | 31½ | 31½ | 33½ |
| **RADIO CORP. OF AMER., pf.—50** | £ 51½ | 32* | 61½* |
| Radio Corp. of Amer., com.—no par. | 49½ | 48½ | 54½ |
| Republic Ry. & Lt., pf. | 115 | 95* | 120* |
| Republic Ry. & Lt., com. | 124 | 75* | 116* |
| Rochester Gas & Elec., 5% pf. | *m*95 | .... | .... |
| Rochester Gas & Elec. Ser. D, 6% pf. | £102 | 98* | 102* |
| Rochester Gas & Elec., 7% pf. | 102 | 105* | 107* |
| **SAFETY CABLE, com. $4.** | 55½ | 52½ | 55½ |
| San Joaquin Lt. & Pwr., 7% pf. | 106 | 97½* | 108* |
| St. Joseph Ry., L., H. & P., 5% pf. | 67 | 60* | 70* |
| Servel Corp. | 9½ | 7½ | 9½ |
| Sierra Pacific Elec., com. | 27½ | 26½ | 27½ |
| Sioux City Gas & Elec., 7% pf. | 101 | 96* | 101½* |
| Southeastern Pwr. & Lt., pf.—$7 no par. | £101½ | 97* | 103* |
| Southeastern Pwr. & Lt., $6 ptc. pf. | £ 67½ | 60* | 68½* |
| Southeastern Pwr. & Lt., com.—no par. | 30½ | 30½ | 32½ |
| So. Calif. Edison, 8% pf. | 34 | 32½* | 36* |
| So. Calif. Edison, 7% pf. | 28 | 27½ | 28 |
| So. Calif. Edison, 6% pf. | 24½ | 24½ | 24½ |
| So. Calif. Edison, 8% com. | 33½ | 31 | 34½ |
| Southern Cities Utilities, 7% pf. | *m* 85 | 85* | 90* |
| Southern Cities Utilities, com. $4. | 30 | .... | .... |
| Southwestern Lt. & Pwr., A $3. | 63 | 52* | 60* |
| Southwestern Lt. & Pwr., B. | 63 | 38* | 58* |
| Southwestern Lt. & Pwr., $6 pf. | 84 | 78* | 82* |
| Southwestern Pwr. & Lt., 7% pf. | £104½ | 100* | 105* |
| Springfield (Mo.) Ry. & Lt., 7% pf. | 97 | 95* | 100* |
| Standard Gas & Elec., 8% pf. | 57½ | 57½ | 58½ |
| Standard Gas & Elec., 7% pf. | 104½ | 97½* | 105½* |
| Standard G. & E., com. $3—no par. | 54½ | 54½ | 55½ |
| Standard Pwr. & Lt., 7% pf. | 97 | 90* | 98½* |
| Staten Island Edison, pf.—$6—no par. | 99 | 93* | 97½* |
| Superheater, $6 com.—no par. | 167 | 138* | 173* |
| Syracuse Lighting, 7% pf. | 102 | 105* | 107* |
| Syracuse Lighting, 8% pf. | 115 | .... | .... |
| Syracuse Lighting, 8% com. | 300 | 280* | 355* |
| **TAMPA ELEC., com. $2.** | 56½ | 49 | 57½ |
| Tenn. Elec. Pwr., 6% pf. | 92 | 87* | 90* |
| Tenn. Elec. Pwr., 7% pf. | 102 | 98* | 105* |
| Terre Haute, Ind. & East. Trac., 5% pf. | 20 | 20* | 37* |
| Terre Haute, Ind. & East. Trac., com | 1 | 1* | 7* |
| Tex. Pwr. & Lt., 7% pf. ex. div. | £105 | 107 | 109 |
| Tide Water Pwr., 8% pf. | 105 | 101* | 106* |
| Timken Roller Bear., com.—$4 no par. | 84½ | 78 | 84½ |
| Toledo Edison, 8% pf. | £114 | 114 | 114 |
| Toledo Edison, 7% pf. | £104 | 104 | 104 |
| Toledo Edison, 6% pf. | £ 94½ | 94½ | 94½ |
| Toledo Edison, 6% com. | 100 | .... | .... |
| Tri-City Ry. & Lt., 6% pf. | 90 | 87½* | 90* |
| **UNITED GAS & ELEC., 6% pf.** | 98 | 94* | 97* |
| United Gas & Elec., com.—no par. | *m*57 | 56* | 66* |
| United Gas & Elec. (N. J.) 5% pf. | 69 | 70* | 75* |
| United Gas Impr., 8% com.—50. | *c* 92 | 84½* | 144½* |
| United Lt. & Pwr., pf.—$4—no par. | 50 | 44* | 53* |
| United Lt. & Pwr., pf.—$6.50—no par. | 87½ | 81* | 91* |
| United L. & P., com. A .48—no par. | 14½ | 13½ | 15½ |
| United L. & P., com. B .48—no par. | £ 16 | 13* | 20* |
| Utah Pwr. & Lt., 7% pf. | £103½ | 103½ | 104½ |
| Utica Gas & Elec., 7% pf. | 104½ | 103* | 106* |
| Utica Gas & Elec., 8% com. | 200 | .... | .... |
| Utilities Pwr. & Lt., 7% pf. | 93½ | 92* | 98* |
| Utilities Pwr. & Lt., com. A $2. | *m* 27 | 27½* | 37* |
| Utilities Pwr. & Lt., com. B $1—no par. | £13½ | 13½* | 18* |
| **VERMONT HYDRO-ELEC., 7% pf.** | 95 | 94* | 96* |
| Virginia Elec. & Pwr., 7% pf. | 104 | 101* | 105* |
| Virginian Pwr., 7% pf. | 108 | 102* | 104* |
| Virginian Pwr., com. | 70 | 65* | 75* |
| **WAGNER ELEC., 7% pf.** | £ 71½ | 69* | 71½* |
| Wagner Elec., com.†—no par. | £ 22 | 18½* | 22* |
| Washington Ry. & Elec., 5% com. | £180 | .... | .... |
| Washington Ry. & Elec., 5% pf. | £ 90½ | .... | .... |
| Washington Wtr. Pwr., 8% com. | 136 | 130* | 138* |
| West Mo. Pwr., 7% pf. | *m*92 | .... | .... |
| West Penn Elec., 7% pf. | 106 | 102 | 107 |
| West Penn Elec., Cl. A $7. | 100½ | 97½ | 101½ |
| West Penn Pwr., 7% pf. | 111½ | 111 | 114 |
| West Penn Pwr., 6% pf. | 102 | 102 | 103 |
| West Virginia Lt., Ht. & Pwr., 7% pf. | 94½ | 95* | 98* |
| West Va. Utilities, 7% pf.—50. | 49 | 45* | 51* |
| Western Pwr., 7% pf. | 99 | 98 | 101 |
| Western States Gas & Elec., 7% pf. | 94½ | 89* | 94½* |
| Western States Gas & Elec., com. | 17 | .... | .... |
| Westinghouse Elec. & Mfg., 8% com. —50 | 69½ | 67½ | 70½ |
| Weston Elec. Instrument, Cl. A $2.01 —no par. | £ 31 | 27½* | 32½* |
| Weston Elec. Instrument, com.—no par. | £ 15 | 13½* | 19½* |
| Wheeling Elec., 6% pf. | £ 95 | 91* | 97* |
| Wis. Pwr., Lt. & Ht., 7% pf. | £ 95 | 85* | 91* |
| Worthington Pump, 7% pf. A. | £ 47 | 44* | 80* |
| Worthington Pump, 6% B. | £ 41 | 37½* | 65* |
| Worthington Pump, com. | 22½ | 22 | 24 |
| **YALE & TOWNE com. $5—25.** | £ 70 | 60½ | 72½ |

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Franisco; *i*Pittsburgh; *j*Washington. £Bid price Saturday, Jan. 15. £Bid price Wednesday, Jan. 19. *m*Latest quotations available. *1926. †Dividend rate variable.

The total funded debt to be outstanding upon completion of this financing will be less than 60 per cent of the valuation of the company's property.

The Central Hudson Gas & Electric Corporation issued first and refunding mortgage gold bonds, amounting to $8,000,000, the price being 101½ and interest, to yield over 4.90 per cent. The corporation is a recent consolidation of companies serving an extensive territory in the Hudson River Valley between New York City and Albany. The proceeds of these bonds, dated Jan. 1, 1927, and maturing Jan. 1, 1957, will reimburse the company for its expenditures in retiring $6,140,800 in bonds of the companies consolidated and for certain additions and improvements already made to its properties.

A five-million-dollar offering was made during the week under review by the People's Light & Power Corporation in the form of 6 per cent convertible gold debentures, series of 1962. These debentures were priced at 98 and interest, to yield over 6.15 per cent. They will be convertible, at face value, on or before Jan. 1, 1952, into class A common stock of the corporation at the following prices: To and including Jan. 1, 1932, $32.50 per share; thereafter to and including Jan. 1, 1937, $37.50 per share; thereafter to and including Jan. 1, 1942, $45 per share; thereafter to and including Jan. 1, 1947, $50 per share; thereafter to and including Jan. 1, 1952, $60 per share.

The Penn-Ohio Edison Company offered an additional issue of 7 per cent cumulative prior preference stock to the amount of $1,500,000, the price being 99 and accrued dividend to yield over 7 per cent. This stock is followed by 51,914 shares of no par value preferred stock and by 344,459 shares of no par value common stock.

**Iowa Southern Utilities Increases Capital.**—The Iowa Southern Utilities Company has filed a certificate at Dover, Del., increasing its authorized stated capital stock from $10,000,000 to $25,000,000.

**Electric Household Company Passes Dividend.** — Directors of the Electric Household Utilities Company have voted to omit the quarterly dividend due at this time. This action was taken because the board anticipates that additional requirements for working capital will be necessary to carry out the enlargement program of the management.

**Blackstone Valley Stockholders to Subscribe to Additional Stock.**—Stockholders of the Blackstone Valley Gas & Electric Company of record Feb. 1 will be given the right to subscribe on or before March 2 for 25,987 additional shares of capital stock at par ($50)

on the basis of one new share for each five shares held. This will increase the authorized and outstanding capital stock to $7,796,200.

## Utility Bonds Called in January Total $42,000,000

Among the corporate bonds called for payment in January in advance of maturity were securities of electric light and power companies to the amount of $42,879,200. Of this total $42,555,200 represents issues called in entirety, while $324,000, the balance, represents parts of issues.

| Issues | Due | Amount |
|---|---|---|
| Nevada-California Electric, A 6s | 1945 | $9,341,800 |
| North American Light & Pwr., 7s | 1954 | 7,409,600 |
| Western Power, deb. A, 6½s | 1954 | 5,965,500 |
| Siemens & Halske, 7s | 1928 | 5,000,000 |
| Santiago Elec. Lt. & Trac., 6s | 1959 | 2,057,000 |
| Associated Gas & Elec., cv. 6½s | 1954 | 1,849,000 |
| Southern Sierras Power, 6s | 1936 | 1,784,000 |
| Central West Public Service, 5½s | 1927 | 1,550,000 |
| Union Power, 7s | 1933 | 863,500 |
| Interstate Public Service, 5s | 1945 | 800,000 |
| Pine Bluff Company, 5s | 1942 | 700,000 |
| Union Utilities, 5s | 1944 | 639,000 |
| Northwestern Electric Service, 6s | 1962 | 582,000 |
| Los Angeles Electric, 5s | 1928 | 482,000 |
| Milledgeville Ltg., 6s | 1949 | 300,000 |
| Midland County Gas & Elec., 6s | 1932 | 246,000 |
| Indiana Public Service, 5s | 1931 | 100,000 |
| Laconia Gas & Electric, 8s | 1931 | 98,000 |
| Madison Power, 6s | 1951 | 96,900 |
| Murray Electric Light & Pwr., 6s | 1943 | 90,900 |
| Wisconsin Gas & Electric, D,6s | 1933 | 100,000 |
| Lake Superior District Pwr., 6½s | 1942 | 2,500,000 |
| Siemens & Halske, 7s* | 1935 | 132,000 |
| Union Elec. Lt. & Pwr., 5½s* | 1954 | 125,000 |
| So. Indiana Gas & Elec., 7s* | 1934 | 35,000 |
| Central States Pwr. & Lt., 6s* | 1945 | 19,000 |
| Tennessee Electric Power, 6½s* | 1939 | 13,000 |

* Not entire issues.

**Foshay Company Declares Bonus Dividends.** — Directors of the W. B. Foshay Company have declared bonus dividends on two preferred-stock issues and an extra dividend on the common shares of the company. The bonus dividends amount to 2 per cent on the company's 7 per cent preferred and 1 per cent on the 8 per cent preferred, while the extra dividend on the $100 par value common amounts to 1 per cent. All dividends are payable Feb. 25 in cash to stock of record Jan. 5, 1927.

**New England Association to Acquire Rhode Island Company.**—Stockholders of the New England Power Association at a meeting to be called shortly will be asked to ratify the purchase of the entire class B stock of the Rhode Island Public Service Company. The Rhode Island Company was organized not long ago to acquire control of the Narragansett Electric Lighting Company, which does the electric and gas business, and of the United Electric Railway Company, which operates the traction lines and buses in the city of Providence.

**North Boston Properties to Increase Stock.**—Stockholders of the North Boston Lighting Properties will vote Jan. 25 on authorizing an increase in the capital stock by 60,130 shares. The purpose of the increase is to provide funds with which to pay indebtedness incurred or to be incurred in the acquisition of shares in the several companies in which the North Boston Lighting Properties are stockholders. At the meeting the price and the manner in which the new shares will be issued will be decided.

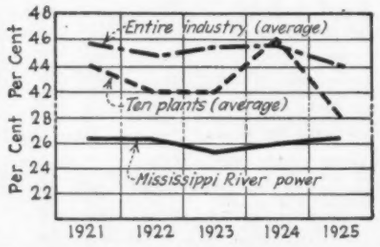
**Baltimore Utility to Offer Stock to Employees.**—Stockholders of the Consolidated Gas, Electric Light & Power Company of Baltimore will be asked to ratify a proposal whereby the company may from time to time offer shares of its common stock to its employees without previously offering such shares to existing stockholders. Only preferred and common stockholders of record of Jan. 20 will be entitled to vote at the meeting, which has been called for Feb. 9. At the same time formal action will be taken on the proposal that the Baltimore Electric Company and the Maryland Securities Company sell all their assets to the Consolidated company, or exchange them for other securities. The two companies are to be acquired through a consideration in cash and common stock.

**Canadian Holding Company Offers Stock.**—Six per cent cumulative first preferred stock of the Power Corporation of Canada was recently offered to the amount of $2,500,000, the price being $96 per share, to yield 6¼ per cent. Proceeds will be used for the acquisition of the control of, or a substantial interest in, hydro-electric and public utility companies, but temporarily may be invested in other high-grade bonds and dividend-paying stocks.

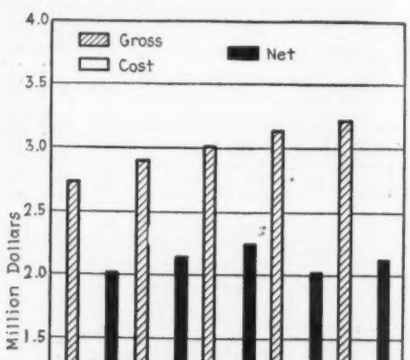
# Mississippi River Power Shows Growth

### Operating Ratio Is Among the Lowest in the Country, Averaging 26 for the Past Five Years

BOASTING an operating ratio which has averaged as low as 26 over a period of years, the Mississippi River Power Company is a leader among the country's utilities in this regard. This has permitted of an unusually large percentage of net revenue from gross, net being approximately 75 per cent of gross in 1925. This notwithstanding, the company has shown a much less rapid growth during recent years than the industry as a whole. Gross earnings increased by only 16 per cent since 1920, while the industry as a whole expanded its gross revenue by 107 per cent during the same period.




OPERATING RATIO MUCH LOWER THAN AVERAGE OF ENTIRE INDUSTRY AND OF TEN HYDRO PLANTS




REVENUE AND OPERATING COSTS OF THE MISSISSIPPI RIVER POWER COMPANY

SET-UP, EARNINGS AND FINANCIAL POSITION OF MISSISSIPPI RIVER POWER COMPANY

1. **Financial Set-Up** (Dec. 31, 1925):
   - Ratio debt to capitalization, 42.9 per cent.
   - Ratio gross revenue to capitalization, 7.6 per cent.
   - Ratio funded debt to capitalization, 56.3 per cent.
   - Ratio investment to capitalization, 113 per cent.
   - Ratio investment to gross, 6.7 per cent.
2. **Revenue Record:**
   - Ratio operating expenses to gross, 26 per cent.
   - Ratio revenue to total assets, 6.5 per cent.
   - Ratio net earnings to revenue, 66.1 per cent.
   - Times bond interest earned, 2½ times.
   - Preferred dividend earned, $12.35.
   - Preferred dividend paid, $6.00.
   - Common dividend earned, $3.27.
   - Earnings compared with whole industry—Less rapid growth.
3. **Trust Investment Tests:**
   - Life of franchise after bond maturity —Not limited in time.
   - Percentage debt to book value of property, 38 per cent.
   - Size of gross, $3,290,485.
   - Size of net, $2,435,659.
4. **Business Progress:**
   - Growth in gross, 3 per cent over 1924.
   - Growth in net, 3 per cent over 1924.

The capital structure of the Mississippi River Power is well balanced. Bonded debt amounts to about 43 per cent of capitalization, and indebtedness amounts to about $7.50 per dollar of net earnings. This is quite within the limits, it being usually regarded as satisfactory if debt does not exceed $10 per dollar of net.

**Listings.** — The Boston Stock Exchange has authorized the listing of additional first mortgage 6 per cent gold bonds, series B, to the amount of $1,684,000, making in all $5,720,000 face of such bonds, series B, to be authorized for the list. The proceeds from this additional issue of bonds are to be used at the rate of 75 per cent of the cost of additions, betterments and acquisitions, reimbursing the treasury of the company for a portion of such expenditures. The Chicago Stock Exchange has authorized the listing of additional 7 per cent prior lien stock of the Laclede Gas & Electric Company, making the total applied for $3,000,000.

# Manufacturing and Markets

## Large Volume of Construction in 1926

### Eleven per Cent Increase Recorded Over 1925—Construction Has Gained Steadily Ever Since 1921

A NEW high record was established in the construction industry during 1926, both as to value of contracts let and the actual volume of work accomplished, according to the *Engineering News-Record's* statistics. Since 1921 construction has gained steadily, year by year. The record volume, as measured by materials used, is accentuated by the fact that the average cost of construction for the twelve months of 1926 was only 2 per cent above the average cost recorded for the last five years.

#### Construction Volume Index

The construction volume index number for the month of December is 188, which compares with 201 for the whole of 1925, 228 for the whole of 1926 and 100 for 1913. This index number is a measure of the actual volume of contracts let and not the mere money value of the contracts, and at the same time contains the increment of construction and indicates the actual rate at which construction contracts are being let as compared with contracts let in 1913.

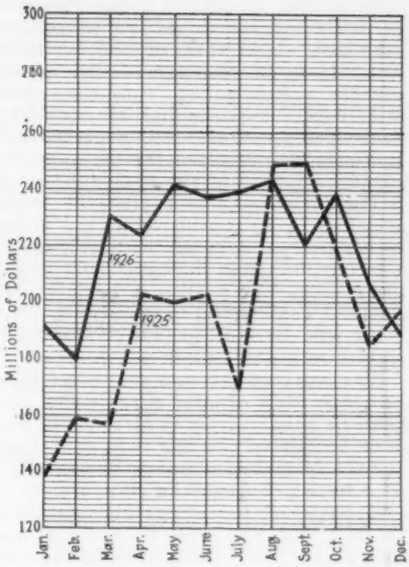
In the accompanying table only heavy construction or engineering work is included, and in arriving at these figures the following minimum was adopted in each case: Waterworks and excavations, drainage, irrigation, river, levee and harbor work, $15,000; other public work, $25,000; industrial buildings, $40,000; commercial, educational, religious and other types of buildings, $150,000.

#### All Sections Show Gain

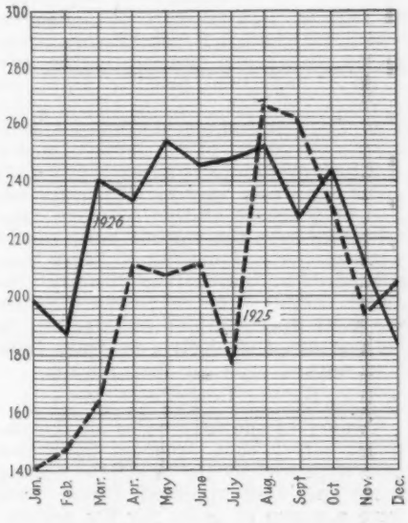
Every section of the country showed a gain over 1925, except the Middle Atlantic States, which declined 8 per cent in total money value. The Middle West netted the heaviest gain for 1926. All classes of construction registered increases in money value of lettings except waterworks and jobs classified as excavations. The drop in the former amounted to 11 per cent, while that of the latter was even more pronounced. All classes of engineering construction for the entire country showed a gain of 11 per cent over the previous record year 1925.

In the states of Michigan, Iowa, Illinois, Connecticut, New Jersey, Maryland and Texas construction was definitely larger in 1926 than in 1925. Only five states showed a decline in construction volume.

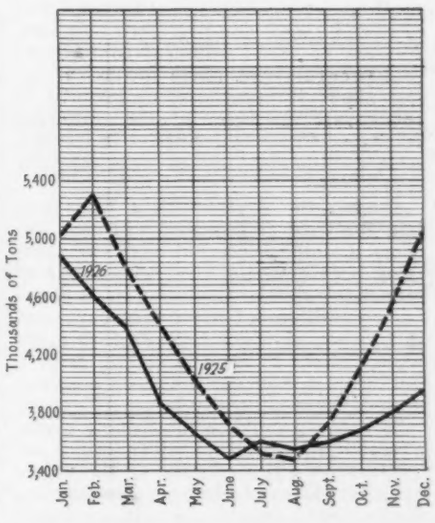
New engineering work proposed during December, 1926, reached a total of $586,724,000, a gain of 25 per cent over the same month in 1925. Total proposed for the year 1926 amounted to $5,556,270,000, as against $4,833,614,000 for the whole of 1925. Since projects definitely reported as proposed are rarely abandoned, the volume at hand will undoubtedly sustain contract letting throughout the first quarter as somewhere near the 1926 rate.




Contracts Awarded in the United States




Construction Volume as Compared with an Index of 100 for 1913




Unfilled Tonnage as Reported by the United States Steel Corporation

In the chart at the left the actual volume of construction is compared and not the mere money value of contracts let. (*Engineering News-Record* statistics.)

VALUE OF CONTRACTS AWARDED IN THE UNITED STATES AND CANADA, DECEMBER, 1926—TOTALS FOR 1926 AND 1925

| | New England | Middle Atlantic | South | Middle West | West of Mississippi | Far West | United States | Canada | Total for U. S., 1926 | Total for U. S., 1925 |
|---|---|---|---|---|---|---|---|---|---|---|
| Waterworks | ..... | $881,000 | $396,000 | $3,153,000 | $1,060,000 | $407,000 | $5,987,000 | $181,000 | **$61,647,000** | $69,368000 |
| Sewers | $431,000 | 814,000 | 504,000 | 2,611,000 | 743,000 | 2,189,000 | 7,292,000 | 233,000 | **103,741,000** | 84,577,000 |
| Bridges | 83,000 | 2,446,000 | 591,000 | 503,000 | 1,833,000 | 104,000 | 5,559,000 | 400,000 | **83,383,000** | 69,876,000 |
| Excavation, drainage, irrigation | ..... | 86,000 | 67,000 | 78,000 | 239,000 | 15,000 | 485,000 | ..... | **27,810,000** | 40,080,000 |
| Streets and roads | 2,132,000 | 2,637,000 | 6,389,000 | 1,854,000 | 6,549,000 | 4,508,000 | 24,069,000 | 238,000 | **483,898,000** | 421,039,000 |
| Industrial buildings | 4,110,000 | 4,560,000 | 1,085,000 | 5,704,000 | 3,640,000 | 1,250,000 | 20,349,000 | 225 000 | **311,605,000** | 227 616,000 |
| Commercial buildings | 12,523,000 | 28,005,000 | 4,439,000 | 42,674,000 | 11,341,000 | 25,169,000 | 124,151,000 | 2,100,000 | **1,482,946,000** | 1,374,100,000 |
| Federal government | 83,000 | 286,000 | 537,000 | 77,000 | 156,000 | 2,333,000 | 3,472,000 | ..... | **50,262,000** | 34,272,000 |
| Unclassified | 385,000 | 25,336,000 | 5,564,000 | 1,050,000 | 5,297,000 | 692,000 | 38,329,000 | 270,000 | **244,494,000** | 238,515,000 |
| December, 1926 | $1,593,000 | $65,051,000 | $19,572,000 | $57,709,000 | $30,858,000 | $36,667,000 | $229,603,000 | $3,647,000 | **$2,851,786,000** | $2,559,443,000 |
| November, 1926 | 24,031,000 | 53,308,000 | 26,659,000 | 56,660,000 | 24,303,000 | 21,860,000 | 206,821,000 | 40,313,000 | ..... | ..... |
| December, 1925 | 11,699,000 | 101,006,000 | 23,811,000 | 51,932,000 | 25,602,000 | 32,869,000 | 246,919,000 | 1,232,000 | ..... | ..... |
| Total for 1926 | **247,095,000** | **856,327,000** | **288,891,000** | **724,428,000** | **412,401,000** | **322,644,000** | **2,851,786,000** | **144,347,000** | ..... | ..... |
| Total for 1925 | 199,370,000 | 935,216,000 | 247,966,000 | 474,212,000 | 407,558,000 | 295,121,000 | 2,559,443,000 | 83,067,000 | ..... | ..... |

NOTE.—Owing to five weeks of construction contracts being included in some months, as in September, the figure for the total contracts let, as shown in the table, does not agree with the figure as represented in the curve. In order to obtain comparable figures the curve is worked out on a four-week basis for each month.

# Industrial Standardizing

**Developments in 1926 Cited by A.E.S.C. —Forward Steps in International Co-operation Are Taken**

NOTABLE developments in the industrial standardization movement, including important progress in the mechanical and mining industries, in industrial safety, its further extension through managerial and trade association activities, and forward steps in international co-operation, have marked 1926, according to an announcement of the American Engineering Standards Committee, which states that standardization was the subject of a special report at the recent conference of the premiers of the British Empire. The committee points out that systematic organization of company standardization work is leading to a much larger degree of co-operation between companies.

### INTERNATIONAL STANDARDIZATION

In April there were held in New York the most important international conferences on standardization ever assembled. Of these the two principal were the meeting of the International Electrotechnical Commission, with its group of technical committees, and the third conference of the national standardizing bodies, in connection with which there were international technical conferences on screw threads, ball bearings, gages and preferred numbers. In each of these technical conferences real progress was made toward bringing about international uniformity in industrial practice in the different countries. Twenty countries in Europe, Asia and South America were officially represented.

During the conferences a basis was laid for what it is hoped will soon become a unified international standardizing body covering the general field of industrial standardization. In September committees of the two groups met in London, at which time further steps were taken. Final agreement upon a unified plan has not yet been consummated, there naturally being difficulties inherent in a problem involving a group of national as well as international organizations. The relation of the International Electrotechnical Commission, a specialized organization, to a general standardizing body into which work from the national industrial standardizing bodies shall feed is of special importance in this country.

The fifth year of the Division of Simplified Practice shows steady development, and the unification of government specifications under the Federal Specifications Board has now reached a point where the main lines of government commodities are covered. The Bureau of Standards has proposed an interesting plan of certification under which any manufacturer who is willing to supply goods made to comply with a given government specification may file with the bureau a statement to that effect. Consumers upon request will be given a list of such manufacturers. This plan has been widely discussed in a large number of organized industrial groups, since this proposal in some form may ultimately have far-reaching effects upon sales policies and upon our present method of distribution.

The work of the Bureau of Mines, the American Mining Congress and of other organizations on safety rules for installing and using electrical equipment in coal mines has been unified under the procedure of the American Engineering Standards Committee and formally approved as an American standard. The work of the sectional committees on drainage of coal mines, outside coal-handling equipment and wire rope for mines has all been virtually completed and it is expected will be formally submitted for the approval of the A.E.S.C. in the near future. A particularly important piece of work, which is being considered as the result of a representative conference of interested groups held in Pittsburgh, is the classification of coal as a basis of industrial commercial transactions. The work will cover all grades of coal from lignite to anthracite.

The work of the sectional committee on tooth form of spur gears which has been in progress for several years has been completed and has been submitted for the formal approval of the A.E.S.C. as a tentative American standard. Several parts of the comprehensive work on bolt, nut and rivet proportions are now nearly completed, and the same is true of several sections of the work on pipe flanges and fittings. It is expected that the first of these to be issued will be that on high-pressure steel flanges, which, although not yet officially completed, is already practically the sole basis of industrial practice in recent advances in high-pressure steam practice. The work on mechanical standards now in the course of development under A.E.S.C. procedure is so extensive that plans are under way for the organization of a representative advisory committee to keep the various parts of the work properly co-ordinated. More than a hundred million railway ties are produced in this country yearly. During the year specifications satisfactory to both steam and electric railways have been agreed upon for the first time.

### SAFETY CODE PROGRAM

Twenty of the fifty codes on the national safety code program have now been approved by the A.E.S.C. Among those receiving approval during 1926 were a group of codes for the prevention of dust explosions and new editions of the codes for abrasive wheels and punch presses. A particularly important development has been the revision of the National Electrical Code, which is the industry's bible for wiring devices. This included a settlement by almost unanimous action of a controversy of three years' standing over the admission as approved material of non-metallic sheathed cable. This new material was approved for limited uses. In connection with the safety code program, and upon the initiative of the state industrial commissions, arrangements have been made for a revision of the standard plan of reporting and compiling accident statistics under the procedure of the American Engineering Standards Committee. This plan forms the basis of the accident statistics of the various state governments and casualty insurance companies.

# Details of Lincoln Award

**Preliminary Rules for Arc-Welding Contest Prepared by A.S.M.E., the Custodian of the Fund**

THE custody of a fund of $17,500 provided by the Lincoln Electric Company, Cleveland, to be awarded in a world competition for the greatest improvement made in the art of arc welding during 1927 has been accepted by the American Society of Mechanical Engineers. The prizes bestowed will consist of a first award of $10,000, a second of $5,000 and a third of $2,500. J. F. Lincoln, vice-president of the Lincoln Electric Company, in presenting the matter to the society pointed out that the prizes are offered with the sincere desire to promote the whole art of arc welding and to reduce the cost of carrying out mechanical designs and construction. An announcement of the offering of the prizes appeared on page 1287 of the Dec. 18, 1926, issue of the ELECTRICAL WORLD.

The prizes are to be administered by the council of the American Society of Mechanical Engineers, which will invite qualified experts to assist. A more extended statement of the conditions of award of the prizes is being prepared, but the following information has been made available for the guidance of prospective contestants:

1. The award to be made for the year 1927 as soon after Jan. 1, 1928, as practicable.
2. Any one in any country of the world may try for these prizes, but papers must be submitted in the English language.
3. The papers in competition are to be supplied in duplicate to the council of the A.S.M.E., addressed to its secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, before Jan. 1, 1928. Any delay thereafter will exclude a paper from the competition.
4. To assist authors in the preparation of papers for this competition, the following conditions are added:

(a) The paper should include drawings of the design and careful description of apparatus needed to carry out ideas of the writer.

(b) The utility of the suggestions must be shown not only for the application but also for possible use in connection with other designs and for their purposes.

(c) The economic saving to the industry—and therefore to mankind—by the use of the methods suggested should be pointed out.

(d) A demonstration of the practicability of the process and design is necessary. It is not necessary, however, that the actual application of this suggestion be fully shown, if a clear statement is made of possible uses.

(e) Originality of design is preferable either in the method of applying the weld or in the design of the welding parts for their arrangement. Designs which are of no practical use will only be considered in case they include suggestions which could self-evidently be applied in other ways than those suggested.

(f) Methods of applying the arc or the welding art which will improve existing machines or make commercially possible machines which in the light of previous engineering have been regarded as impracticable are specially desired.

(g) It is not necessary that all parts of the structure should be made of welded metal. It is only necessary that one or more parts be so made.

(h) Although it is stated that the limit of time will be Jan. 1, 1928, it will be well to submit papers in competition as soon as they are prepared; that is, as early as possible in the year. In case two or more identical suggestions are received, the one arriving in the hands of the secretary of the American Society of Mechanical Engineers first will have precedence over those following.

(i) It is recommended that the small amount of literature available be studied to get the fundamental principles which govern redesign. Numerous articles have

appeared in the trade journals which will be valuable, and certain companies have done much work that will be helpful in getting out a paper.

5. The council of the American Society of Mechanical Engineers may withhold any or all awards.

6. To facilitate filing and transmitting, it will be necessary that the paper be typewritten on one side of paper 8½ in. x 11 in., bound at the top with covers that will protect it. The name and address of the sender should appear on the front cover, and if possible a brief statement of his qualifications should be included with the letter of transmittal.

# Business Conditions

A SLIGHT reaction is evident in the business of the industry, but manufacturers have received many inquiries and there is every indication of continued steady business.

The aggregate business is large in the Middle West, one central-station company expending more than $85,000 a day. On the Pacific Coast improved business continues. Congress has appropriated $200,000 for building a power plant at the Puget Sound navy yard at Bremerton. An order for $150,000 worth of switches and control was placed by a central Massachusetts steel mill, another, for $75,000 worth of potheads, was reported, and a 10,000-kw. turbo-generator set was purchased for installation in the Carolinas. A central-station company in the Southeast bought for stock 16 miles of No. 4/0 copper cable, amounting to $8,500; $4,000 worth of poles, and $33,200 worth of assorted wire products. Important street-lighting equipment orders covered one for $125,000 in the South, another for $125,000 for Oakland, Cal., and a third for $60,000 for Berkeley, Cal. Two 60-ton electric freight locomotives, valued at $50,000 each, were also sold to the Sacramento Northern Railway.

In New England inquiries are in good volume with transformers, turbo-generators and control and switching apparatus attracting most attention, and motor sales are steady. New York saw an increasing volume of sales of various kinds to central-station organizations, and quotations were asked by many inquirers. Circuit breakers were particularly active. In the Southeast central-station companies are purchasing for their immediate requirements and the volume of orders is satisfactory.

Buying in the St. Louis district is not back to normal since the holidays, but the great majority report prospects for the new year to be excellent.

## Metal Prices Easier—Zinc, Copper and Lead Weaken

Prices on the non-ferrous metal market were generally low, and the volume of business was, if anything, below normal. Zinc suffered the largest decline. The copper market, which was lively a week ago Wednesday, has been dull since the following Saturday, and on Tuesday sellers reduced their prices to 13¼ cents, but transactions were few. Foreign business in January has been exceptionally brisk. Business in lead has been only fairly good and not equal to that of the week before. Some offerings were made at slight concessions from the American Smelting & Refining Company's official contract price of 7.65 cents. Zinc declined 30 points, probably owing to absence of active buying on the part of galvanizers, with only a small curtailment in production. Tin business has been meager.

NEW YORK METAL MARKET PRICES

| | Jan. 12, 1927 Cents per Pound | Jan. 19, 1927 Cents per Pound |
|---|---|---|
| Copper electrolytic | 13¼ | 13¼ |
| Lead, Am. S. & R. price | 7.65 | 7.65 |
| Antimony | 13½ | 14½ |
| Nickel, ingot | 35 | 35 |
| Zinc spots | 7¼ | 6.80 |
| Tin, Straits | 67¼ | 66¾ |
| Aluminum, 99 per cent. | 27 | 27 |

Base copper price Jan. 19, 1927, 15½ cents.

## Utility Companies Buying Steadily in Southeast

There is an apparent tendency in the Southeast to await more definite decisions on plans for 1927 before launching any large undertakings. Central-station companies are purchasing for their immediate requirements and the volume of orders is reasonably satisfactory. An order was placed for a 10,000-kw. turbo-generator set for installation in the Carolinas, and two other jobs of a similar size are in prospect of being closed within the next 30 to 60 days. One of these installations will call for considerable station and switching equipment in addition to the prime mover. Another interesting central-station order reported was for $12,000 worth of oil-circuit-breaker equipment, and prospects are good for an increased activity in 2,300-volt equipment of that type in the next 90 days. Orders from power companies for transformers in sizes from 5 kw. to 100 kw. are reported reasonably satisfactory, one company's purchases of this equipment in the past two weeks amounting to approximately $12,000.

Sustained activity is reported in line construction materials, and orders were placed by one of the larger power companies for 16 miles of No. 4/0 copper cable, amounting to $8,500, and $4,000 worth of poles for special projects, while orders for $10,700 worth of cable and copper wire and weatherproof wire amounting to $22,500 are among central-station purchases for stock. In connection with the change of its direct-current distribution system to alternating current, one company ordered $11,000 worth of elevator equipment for immediate delivery. "White-way" lighting equipment has been somewhat slow for several months past, but the general volume was considerably bolstered by the receipt of an order for $125,000 worth of this equipment of special design.

## New York Reports Circuit Breakers in Especial Demand

An increasing volume of diversified sales to public utility companies and a steady flow of inquiries for quotations were the features this week in the New York district. Circuit breakers are very active, one manufacturer reporting that his sales so far this month exceed those of the two previous months. Transformers and substation apparatus also continue in good demand, and substantial orders for this equipment are expected to be placed within the next few days. Sales of poles, cross-arms and hardware are fair and inquiries are encouraging. Sales of motors for industrial uses are slightly weaker, and the demand for control apparatus is poor.

## Aggregate Business Large in Middle West

The volume of business in the Middle West varies in different lines, but in the aggregate a large volume is being transacted. Central-station purchasing continues good, as indicated by an expenditure of over $85,000 per day by one large utility company. Maintenance purchasing is particularly heavy for this time of the year. Among the interesting orders placed was one for disconnecting potheads, valued at $75,000, and one for 950 direct-current watt-hour meters, 5 amp. to 1,200 amp., and 108 current transformers. Several good-sized orders for varnished-cambric cables were placed, and there is a good demand for pole-line hardware. The National Electric Light Association's concurrent campaigns on appliance sales last year proved very effective, and it is anticipated that they will be larger this year.

## Buying in St. Louis District Not Back to Normal

While buying in the St. Louis district has not come back to its normal condition in the northern section since the holidays, orders for transmission-line material have been received in good volume from the southwest section. No very large contracts have been placed, but inquiries have been made for a number of good-sized substation equipment jobs. All but one of the large manufacturers report prospects for the new year to be excellent. One company is disposed to be conservative in its estimates.

## Inquiries in Good Volume in New England District

Inquiries in good volume are being received in the New England territory, with transformers, turbo-generators and control and switching apparatus attracting most attention. Outstanding during the past week was an order for about $150,000, embracing switches and control for a large central Massachusetts steel mill. Activity is also noted in general supplies for central-station companies.

Small-motor sales are steady, and buying is more favorable among milling companies, with the industrial situation a trifle better this year as compared with last. A number of inquiries are reported by one manufacturer for large motors, ranging from

15 hp. up, and negotiations are under way for the installation of several power units for stone crushing. Wire and hardware continue to move in fair volume, transmission line requirements are light, and the demand for new construction supplies dropped off. A slight seasonal reaction evidently prevails throughout the market, according to reports.

### Improved Business Continues on Pacific Coast

Representative orders on the Pacific Coast included one 10,250-kva. and two 12,000-kva. transformers for Lake Spaulding No. 3 power plant, two 60-ton freight locomotives for the Sacramento Northern Railway valued at $50,000 each, eight oil-well drilling and pumping motors for the Kern County fields from 20 hp. to 50 hp., and an aggregate of 100 distribution transformers from 5 kva. to 100 kva. for shipment mainly in the San Joaquin Valley. Two street-lighting jobs—one amounting to $125,000 for Oakland and the other for the city of Berkeley—involved $60,000. Power company inquiries for supplies have largely covered steel strand and poles. Industrial business is good and includes one carload of conduit for an elevator company and 1,000 reflectors for a canning company. Export orders included 64 miles of No. 6 copper wire and 22 miles of steel strand for Mexico and $5,000 worth of supplies for the Philippines. The carpenters' strike in San Francisco has been definitely settled.

In the Seattle and Puget Sound district the sales volume was fair and made up of small and scattered individual orders. Many inquiries have been received covering equipment for proposed pulp and paper plants. The city of Seattle is now taking bids on three-pole gang-operated outdoor-type disconnecting switches and 10,000 ft. of lead-covered cable. Congress has appropriated $200,000 for building a power plant at the Puget Sound navy yard at Bremerton.

# Activities of the Trade

### Industrial Heating School Prize Winners Announced

Prizes for the best set of notes taken at the 1926 industrial electric heating school held at the Mansfield factory of the Westinghouse Electric & Manufacturing Company under the auspices of the industrial heating committee of the National Electric Light Association have been won as follows: First prize, $50, William E. Benninghoff, Cleveland Electric Illuminating Company; second and third prizes, $25 each, Clifford E. Loomis, Cambridge (Mass.) Electric Light Company, and Howard B. Allen, Metropolitan Edison Company, Lebanon, Pa. The 1927 school will be held at the Schenectady works of the General Electric Company from April 18 to 30, the committee in charge being W. H. Sammis, Consumers Power Company, Jackson, Mich.; Wirt S. Scott of the Westinghouse company, and Harold Fulwider, General Electric Company.

### General Electric Orders Reach Highest Recorded Volume

Orders received by the General Electric Company for 1926 totaled $327,400,207, an increase of 8 per cent, or nearly $25,000,000, over those of 1925, according to an announcement by Gerard Swope, president. This is the largest volume of orders in the company's history, the previous high mark, achieved in 1920, being $318,470,000, or about $10,000,000 below the new record.

For the fourth quarter of 1926 orders booked amounted to $80,406,570, compared with $78,636,669 for the last quarter in 1925, or a gain of 2 per cent. Sales billed and earnings for the year 1926 will not be announced until the accounts are closed for the year and the annual report is published in March.

In a statement made to the stockholders and which accompanied the report on the year's business of the company Gerard Swope said: "On the basis of the 1926 volume of sales, price reductions during the year have resulted in an annual saving to the company's customers of upward of $12,000,000, as a result of improved designs, better methods of manufacture, and numerous suggestions from the workmen."

### Westinghouse Gets Orders for 50 Automatic Network Units

The Duquesne Light Company, Pittsburgh, has placed with the Westinghouse Electric & Manufacturing Company an order for 50 automatic network units. Automatic switching is accomplished by means of these units, which will be of the submersible type, sealed for use in moist underground chambers. The initial delivery of fifteen units was made during the first week of January. The conversion of the Duquesne Light Company's 40,000-kw. downtown load to this system will take several months. The low-voltage alternating-current network system has also been adopted in New York City, Memphis, Dallas, New Orleans, Miami, Atlanta and other cities.

### Court of Appeals Reverses Decree in Hell Gate Suit

The United States Circuit Court of Appeals for the second circuit has reversed the decision of the trial court in the case of the Babcock & Wilcox Company against the Springfield Boiler Company and the Superheater Company, as reported in the Aug. 29, 1925, issue of the ELECTRICAL WORLD. The suit concerned infringement of Bell patent No. 1,141,520 for "water-tube boiler" and Pratt reissue patent No. 15,210 for "superheater boiler." The court in its decision says: "The appellees' boiler as constructed reads upon each of the claims sued on—the Bell and Pratt patents. For the reasons we have stated, we think it infringes all the claims in suit."

### Large Steel-Mill Turbine Ordered from General Electric Company

The largest turbo-generator unit ever used by a steel mill will be installed by the Illinois Steel Company at its Gary (Ind.) plant. This equipment, which will be furnished by the General Electric Company, will produce 30,000 kw. at 25 cycles, 6,600 volts, and will operate condensing. The tendency of steel mills to use large prime movers is indicated not only by this but also by other similar installations to be made by other plants. The Tennessee Coal, Iron & Railroad Company is soon to install two 20,000-kw. turbo-generators, and another unit of the same size will be installed by the Bethlehem Steel Company at Sparrow's Point, Md.

### Trumbull-Vanderpoel Opens Offices in New York and Chicago

Beginning Feb. 1, the Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn., manufacturer of safety and knife switches, will open in its own offices at 51 Barclay Street, New York City, and in the Madison Terminal Building, Chicago. The New York office will be under the supervision of George J. Gillingham and Fred Carry, who have been identified with the sales force of the company for some time. The Chicago office and distributing point will be in charge of H. T. Doolittle, who has represented the company in that territory as the D-E Distributing Company. The company feels that with its own offices established in the two largest cities of the country, with complete stocks, better and closer co-operation can be had with the distributing forces.

### Westinghouse Reorganization at East Springfield Plant

A complete reorganization of the engineering department to obtain a better concentration of engineering personnel and facilities at the East Springfield works of the Westinghouse Electric & Manufacturing Company has been announced by W. S. Rugg, vice-president in charge of engineering. C. H. Garcelon, formerly manager of the small-motor engineering of the East Pittsburgh works, has been appointed manager of engineering of the East Springfield works. As manager he will have administrative charge of all engineering at this plant. C. A. M. Weber has been appointed manager of the small-motor engineering department. E. W. Denman has been made section head in charge of the fan-motor section of the small-motor engineering department. A. K. Phillippi will continue to act as resident engineer of the radio engineering department. In the

new plan of operation all fan-motor and small-motor engineering except that of farm lighter and locomotive headlighter work will be done at the East Springfield works. The farm lighter and locomotive headlighter work will be retained at the East Pittsburgh works under J. M. Hipple, present manager of motor engineering.

Announcement is also made of appointments at the St. Louis office by C. E. Allen, district manager of that office of the company. Graeme Ross has been appointed industrial division manager, B. W. Stemmerich transportation division manager, and J. J. Thomason central-station division manager.

**The Electric Refrigerator Corporation**, Detroit, last week laid the cornerstone for a group of four buildings which will be completed in February. With the new plant facilities the company's capacity in 1927 will be one million units.

**The Amtorg Trading Corporation**, 165 Broadway, New York, has issued an elaborate commercial catalog of the United States, containing 1,076 pages and 2,800 illustrations. It is called the "Catalog of American Industry and Trade," is printed in Russian and is especially designed to place American business before every trade executive in the Soviet Union. An economic survey of the United States is also included in the volume.

**The William Cramp & Sons Ship & Engine Building Company**, Richmond, Street, Philadelphia, has organized a new subsidiary, under Delaware laws, to be known as the I. P. Morris Corporation with a capital of $5,000,000 to take over and operate the Morris division of the company, devoted to the manufacture of hydro-electric power equipment.

**The Electric Storage Battery Company**, Nineteenth Street and Allegheny Avenue, Philadelphia, has awarded a contract for a one-story addition to its plant.

**The Western Electric Company**, New York, has taken out a permit for the construction of a five-story unit at its new plant on Central Avenue, Kearny, N. J.

**The Walker Vehicle Company**, Chicago, announces that its Buffalo branch is now at 2933 Main Street.

**The Kant-Kool Electric Water Heater Company, Inc.**, 218 Blandin Street, Utica, N. Y., began operations in that city on Jan. 3 and will manufacture the "Kant-Kool" water heater, sterilizer and electric vaporizer.

**J. E. Sirrine & Company**, Greenville, S. C., engineers, opened a branch office in Birmingham, Ala., on Jan. 1. G. F. Patterson, who has been connected with the organization for the past eight years, will be in charge of this new office.

**The Killark Electric Manufacturing Company**, 3940 Easton Avenue, St. Louis, manufacturer of "Electrolet" conduit fittings and bell-ringing transformers, announces the appointment of two new agents: E. S. Moorer, Greenwood, S. C., will represent the company in South Carolina and North Carolina, and the Atkinson Equipment Company, 318 Atlanta Trust Company Building, Atlanta, will act as agents for the state of Georgia. The Atkinson company will maintain a complete stock on consignment at Atlanta.

**The Servel Corporation, 51 East Forty-second Street, New York, has** concluded a contract with the Southern California Edison Company, Los Angeles, whereby that company will sell Servel refrigerators exclusively during 1927. It is said that this addition to Servel's distribution facilities is the most important which has occurred in some time.

**The American Circular Loom Company**, 90 West Street, New York City, announces the appointment of the H. Lee Reynolds Company with offices in the Henry W. Oliver Building, Pittsburgh, and the Plymouth Building, Cleveland, as its selling representative on "Xduct" and "Electroduct" rigid-steel conduit and its other products. The company states that the Reynolds concern will operate in full harmony with its selling policies, that is, exclusive distribution through jobbing channels.

**The Crocker-Wheeler Electric Manufacturing Company**, Ampere, N. J., announces the following changes in its sales organization, effective since Jan. 1: E. S. Adams, formerly with the Turbine Equipment Company of New York, is now acting district manager of the Buffalo office; H. B. Hussey, formerly district manager of the Buffalo office of the company, is now district manager of the Philadelphia office; S. Russell, Jr., formerly district manager of the Philadelphia office of the company, has been assigned to special work in the Eastern sales division, and K. Landis has been made district manager of the Detroit office.

**The Ward Electric Refrigerator Company**, Beaufait Street, Buchanan, Mich., has let a contract for a one-story addition to its plant.

**The Robbins & Myers Company**, Springfield, Ohio, manufacturer of electric motors, generators and fans, announces the addition to its line of the following new fans: An 8-in. and a 10-in. induction-type non-oscillating fan, a 10-in. induction-type oscillating fan, a 16-in. slow-speed induction-type oscillating fan, a 56-in. alternating-current ceiling fan, style K, and a 54-in. direct-current ceiling fan, style N, which is also available with a lighting-unit adaptation.

**The W. N. Matthews Corporation, St. Louis**, manufacturer of electrical specialties and mechanical painting equipment, announces that Arthur E. Bacon, 1429 Eighteenth Street, Denver, manufacturers' representative, will represent the company in the states of Colorado, New Mexico and Wyoming and in the eleven western counties of Nebraska. Mr. Bacon succeeds the O. H. Davidson Equipment Company of Denver.

# New Equipment Available

## Centrifugal Pumps

A non-plugging centrifugal pump, the design of which is said by the maker to mark a new departure in construction and which obviates the necessity of screens and their maintenance, has been placed on the market by the American Well Works, Aurora, Ill. The single-blade impeller of the pump is so designed that the stream lines are not separated. The stream of fluid is kept in one mass and carried through the pump without being subdivided. By compelling all the liquid and debris to be discharged through a single peripheral passage the possibility is avoided of different portions of a single piece of débris being swept into different outlet passages and thereby being hung up within the impeller. The pump is made in both vertical and horizontal types and is adapted for municipal sewage and general industrial use.

## Convertible Power Panel

A new type of power panel which, in addition to the convertible feature, permits a quick and easy change to 30, 60 or 100-amp. fuses in the circuits, contains testing facilities and is a duplex-design unit that makes it possible to reduce materially the size of the cabinet, has been developed by the Square D Company, Detroit. The test jacks in each circuit are mounted on individual insulating bases, and holes are provided in the cabinet door so that the test plug can be inserted into the jack without opening the door. When the plug is not inserted, the opening in the door is kept closed by means of a sliding cover.

The cabinet is of the duplex design for column mounting with doors on each side of the cabinet. The main busbars are brought down the side of the cabinet, and half the total number of circuits are placed on each side of the cabinet. This construction reduces the size of the cabinet considerably as compared to the panel where all the circuits must be placed on the one side. A compartment at the top or bottom incloses the main lugs, which are set at an angle to make it easy for the connections to be made. All cabinet trims are hinged, and all fuse clips and jaws are mounted on individual insulating bases.

**Electric Steam Radiator.**—An electric steam radiator, with which is combined a thermostat and a magnetic switch, has been placed on the market by the Electric Steam Radiator Corporation, 744 Harrison Street, San Francisco. The unit, known as the "Tesra" electric steam radiator, being independent and provided with a push-button switch, permits individual control of each radiator. It has a three-heat control and the temperature desired is automatically maintained. The unit is provided with a safety valve and is an independent complete steam generating and heating plant.

## New Trade Publications

ELECTRIC FURNACE.—The W. S. Rockwell Company, 50 Church Street, New York City, is distributing bulletin No. 276, which describes and illustrates the new Rockwell revolving-retort type of electric furnace. This furnace is designed for annealing non-ferrous metal parts and is also adapted for the heat-treatment of a great variety of small ferrous and non-ferrous metal parts.

LIGHTING FIXTURES.—Data Sheet No. 13 issued by the W. F. Wakefield Brass Company, Vermilion, Ohio, contains complete prices and data on the Wakefield "Red Spot" hangers.

MOTOR-GENERATOR SETS. — Bulletin No. 145 issued by the Robbins & Myers Company, Springfield, Ohio, describes the Robbins & Myers motor-generator sets, types "B," "SD," "PD" and "DD." Tables showing ratings and dimensions of the sets are included.

STEEL MELTING.—The Ajax Electrothermic Corporation, Trenton, N. J., is distributing a folder calling attention to the use of the Ajax-Northrup high-frequency furnaces for steel melting.

BABBITT-METAL DATA.—The Hoyt Metal Company, Boatmen's Bank Building, St. Louis, is distributing a booklet entitled "Babbitt Metal Data" in which it gives information regarding the selection of babbitt metal and considerations in the designing of babbitt bearings. A table giving the characteristics, such as Brinell hardness, melting points, etc., of its various brands is included.

PROTECTIVE DEVICES.—"A Manual of Reactor Protection" is the title of a booklet issued by the Metropolitan Device Corporation, 1250 Atlantic Avenue, Brooklyn, N. Y., covering the Metropolitan current-limiting reactors. It describes the design and construction of the various types of these reactors and contains a list of practical applications. Illustrations showing a number of power stations equipped with the Metropolitan current-limiting reactors are included.

CENTRIFUGAL AIR COMPRESSORS. —Bulletin GEA-528 issued by the General Electric Company, Schenectady, N. Y., describes the "G-E" small multi-stage centrifugal air compressors. An illustration showing construction details of small multi-stage centrifugal air compressors is given, and curves showing operating characteristics of the compressors are included.

SWITCHBOARD METERS. — The Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 73, superseding bulletin No. 57, covering the Sangamo switchboard meters, both alternating-current and direct-current. Drilling and dimension diagrams and wiring diagrams of its various types of switchboard meters are included. The bulletin also covers the company's line of current shunts and instrument transformers.

STARTING SWITCHES. — The Allen-Bradley Company, Milwaukee, is distributing bulletin No. 709, describing its new type J-1552-form B across-the-line starting switch for small alternating-current motors.

MINE AND INDUSTRIAL TRACK EQUIPMENT.—The Bethlehem Steel Company, Bethlehem, Pa., has issued catalog K entitled "Mine and Industrial Track Equipment and Other Products," in which it gives information relative to Bethlehem products for use in mine and industrial track construction.

## Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is described in Rome, Italy (No. 23,648), for automobile accessories, especially spark plugs, electric refrigerators and washing machines, and resistance wire.

Purchase is desired in Amsterdam, Netherlands (No. 23,657), of electrical goods, and radio sets and parts.

Purchase is desired in Amersfoort, Netherlands (No. 23,624), of electric household appliances, vacuum cleaners and wringing machinery.

Purchase is desired in Charlotte, Saskatchewan, Canada (No. 23,677), of rectifier for storage batteries.

Purchase and agency are desired in Montreal, Canada (No. 23,660), for equipment for hydro-electric plants.

Purchase is desired in Madrid, Spain (No. 23,658), of electrical therapeutic apparatus.

Purchase is desired in Bahia, Brazil (No. 23,618), of electrically operated brick-making machinery and clay-pipe-making machinery.

ELECTRIC PLANT FOR ARGENTINE NAVY DEPARTMENT.—Bids will be received by the Navy Department of Argentina until March 15 for an electric generating plant. Companies must place their bids through the medium of a resident accredited representative in Argentina. There is on file in the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., a clipping from the *Boletin Oficial* (Argentine government official daily) which covers the specifications for the equipment, which will be loaned on request.

## Construction News

**Projects, Plans, Bids and Contracts, Contemplated or Under Way**

### *New England States*

BOSTON, MASS.—The Quincy Market Cold Storage & Warehouse Company, 178 Atlantic Avenue, plans to remodel its power house at 69 Eastern Avenue, to cost about $75,000. F. L. Fairbanks, 133 Commercial Street, is engineer.

WEST MEDWAY, MASS.—A transformer station will be erected in West Medford in connection with the high-tension transmission line to be erected by the Edison Electric Illuminating Company of Boston between Weymouth and West Medway.

BRIDGEPORT, CONN.—Plans are under way by the United Illuminating Company, New Haven, for the construction of a new unit at its local power plant, to cost about $700,000. Westcott & Mapes, New Haven, are engineers.

WINDSOR LOCKS, CONN.—The Northern Connecticut Power Company, Thompsonville, has applied to the Federal Power Commission for a license covering a project on the Connecticut River in Hartford County, Conn., and Hamden County, Mass. The company proposes to build a dam 1,150 ft. long in the east channel and a dam 500 ft. long in the west channel of the river. The former dam will be 17 ft. high and the latter 23 ft. high. It is proposed to install ultimately six units of 8,300 hp. each.

### *Middle Atlantic States*

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Jan. 25, for 50 armatures, 50 sets field coils, 50 control resistances, etc. for the local navy yard (Schedule 6562).

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Jan. 25 for delivering storage battery testing sets, etc., salinometers, thermometers, oxygen regulators, electric fans, etc., to the Navy Supply Depot, Brooklyn.

EAST HAMPTON, N. Y. — The East Hampton Electric Light Company has applied for permission to erect an overhead transmission line in the village of East Hampton and for approval of a franchise granted by the village.

GRAND ISLAND, N. Y. — The Tonawanda Power Company, North Tonawanda, which has acquired the property of the Grand Island Light & Power Company, plans extensions to its system in this section.

MEXICO, N. Y.—The Seneca River Power Company, Baldwinsville, which has acquired the system of the Mexico Electric Company, is planning extensions in its transmission lines in this section.

NEW YORK, N. Y.—Plans are being prepared by the New York Edison Company for a substation at 40-42 Thompson Street.

NEW YORK, N. Y.—Bids will be received by the Park Board, at the office of the Department of Parks, Arsenal Building, Sixty-fourth Street and Fifth Avenue, Central Park, until Jan. 25, for furnishing and installing electric wiring equipment, exclusive of lighting fixtures, in the museum building in the New York Botanical Garden in Bronx Park.

NEW YORK, N. Y.—Bids will be received by the Commissioner of Purchase, Room 1900, Municipal Building, until Jan. 27 for furnishing electrical and telegraph supplies, terminal boxes, cables and batteries to the fire and police departments and the departments of plant and structures and street cleaning for the period ending March 31, 1927.

PORT CHESTER, N. Y.—Plans are under consideration by the Westchester Lighting Company, Mount Vernon, for the installation of a new ornamental lighting system. It is proposed to replace the four-lamp units now in use with single lamps.

POTSDAM, N. Y. — The St. Lawrence County Utilities, Inc., contemplates extensions in its power plant and transmission system.

WHITE PLAINS, N. Y.—Plans are being prepared by the Westchester Lighting Company, Mount Vernon, for the construction of a new operating and headquarters building at Main Street and North Broadway to cost about $2,000,000.

ELIZABETH, N. J.—The Lidgerwood Manufacturing Company, 326 Frelinghuysen Avenue, Newark, plans to build a power plant at its proposed local factory in the Bayway district. The entire project will cost about $175,000.

MEYERSDALE, PA.—The Penn Public Service Corporation, Johnstown, plans to build a substation on Olinger Street, to cost about $150,000.

PHILADELPHIA, PA.—Plans have been filed by the Philadelphia Rapid Transit Company for the construction of a substation at Rising Sun Avenue and Knorr Street.

PORT ALLEGANY, PA.—The municipal electric light plant has been acquired by the Bradford (Pa.) Electric Company.

WASHINGTON, PA.—The installation of ornamental lamps on the principal streets of the city is under consideration by the City Council.

ROCKY MOUNT, VA.—Plans for the proposed new factory unit to be erected by the Bald Knob Furniture Company include an electric power plant. The cost of the entire project is estimated at $175,000.

ROSSLYN, VA.—Plans for rebuilding the local plant of the South Penn Oil Company, Pittsburgh, recently destroyed by fire, include a power plant. The loss is estimated at $300,000.

WASHINGTON, D. C.—Bids will be received by the Purchasing Agent, Post Office Department, Washington, until Jan. 28, for 200 standard battery boxes.

WASHINGTON, D. C.—Preparations are under way for extensive improvements to the street-lighting system, including underground work, during 1927 by the district officials.

WASHINGTON, D. C.—Bids will be received by the Board of District Commissioners, District Building, Washington, until Feb. 3, for cast iron lamp posts and accessories for the electrical department.

WASHINGTON, D. C. — Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until Feb. 2, for magnet wire, cable, electric bells, telephone boxes, switches, resistance units, electric fixtures, etc. (Panama Circular 1779.)

### *North Central States*

MARYSVILLE, MICH.—The Detroit Edison Company, contemplates the construction of a local operating and office building to cost about $75,000. George L. Harvey, 201 Huron Avenue, Port Huron, is architect.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Jan. 28 for installing a complete lighting system in the Hamilton repair shop, located at 4994 Hamilton Avenue, N. E.

COLUMBUS, OHIO.—Contract has been awarded by the City Council for a new street-lighting system, consisting of more than 500 units, of which 96 twin units, with lamps of 1,500 cp. will be installed in the main business section; 106 units, with lamps of 1,500 cp. will be used in the secondary business section; 18 units with lamps of 1,000 cp. will be placed between the secondary business and residential sections, and 143 units with lamps of 600 cp. will be used in the residential section. All electrical equipment will be supplied by the General Electric Company, and the poles, except where old posts are being remodeled.

TORONTO, OHIO.—Plans are being prepared by the Ohio Power Company, Canton, for the installation of an additional 33,000-kw. generating unit with boilers and other auxiliaries at its Toronto power station. Stevens & Wood, Inc., New York City, are engineers and constructors.

BLOOMINGTON, IND.—The Showers Brothers Furniture Company plans to build a new power plant for service at its factory, to cost about $250,000. The H. K. Ferguson Company, Euclid Avenue, Cleveland, is engineer.

INDIANAPOLIS, IND.—An electrical department with laboratory will be installed in the Shortridge High School, to be erected at Thirty-fourth and Meridian Streets, at a cost of $1,000,000. U. M. Frazer, business director of the Board of Education, is in charge.

CUDAHY, WIS.—Plans are being prepared for the installation of a police-alarm system to cost about $15,000. Steinhagen & Steinhagen, 2725 State Street, Milwaukee, are engineers.

MENOMONIE, WIS.—Plans are being prepared by A. D. Conover, Tinney Building, Madison, for a power plant and laundry for Dunn County, to cost about $40,000.

MILWAUKEE, WIS.—The County Board has approved a resolution calling for the installation of electric lamps at fifty-nine street intersections in Milwaukee County, to cost about $7,500. The County Board is also considering a proposal to install a power plant to supply electricity to the county institutions or to purchase it from a private company.

PESHTIGO, WIS.—The Peshtigo Paper Company has engaged Douglas & Cryster, Wisconsin National Bank Building, Milwaukee, engineers, to make a survey of its power facilities with a view of extensions to its power plant.

STOUGHTON, WIS.—The City Council has voted to appropriate $50,000 for the construction of a new municipal electric plant at Dunkirk. The Power Engineering Company, 621 Metropolitan Life Building, Minneapolis, is engineer.

MINNEAPOLIS, MINN.—Bids will be received by F. S. Gram, city purchasing agent, until Feb. 1, for furnishing and installing 743 electric lamp standards for the Board of Park Commissioners.

DES MOINES, IOWA.—The City Council has authorized the installation of ornamental lamps on West Seventh Street and Grand Avenue. K. C. Kastberg is city engineer.

BOLIVAR, MO.—The Ozark Utilities Company contemplates extending its transmission line from Buffalo to Louisburg, Urbans, Preston, Cross Timbers, Hermitage and Wheatland to furnish electricity for light and power in those towns.

DEVILS LAKE, N. D.—Extensions contemplated by the Otter Tail Power Company, Fergus Falls, Minn., include the erection of a low-tension line to Binford and McHenry from which feeder lines can be extended to farms along the line, and also a low-tension line from Hannaford to Luverne. The company is also negotiating for the purchase of the electric plant at Estevan, Sask. If acquired the company plans an extensive development in that section to be served from a large plant to be located at Estavan.

LOUISVILLE, NEB.—Plans for the proposed local cement mill to be erected by the Ash Grove Lime & Portland Cement Company, Grand Avenue Temple Building, Kansas City, Mo., to cost about $2,000,000, include a power plant.

## *Southern States*

MADISON, N. C.—The citizens have voted to sell the municipal electric system to the Southern Public Utilities Company, Charlotte.

SHARON, S. C.—Plans are under way for the erection of a transmission line from Yorkville to Sharon to secure electricity. Service will be furnished by the Southern Public Utilities Company, Charlotte, N. C.

TENNILLE, GA.—The municipal electric distribution system has been acquired by the Georgia Southern Power Company, Dublin, which will erect a 44,000-volt transmission line from Wrightsville, a distance of about 17 miles, to furnish service here.

JACKSONVILLE, FLA.—Bids will be received by G. A. Barry, Dyal Upchurch Building, architect, for construction of a hospital building, including power house, at Bards and St. Johns Streets, for the St. Vincents Hospital, West Fifth Street, to cost about $1,000,000.

JACKSONVILLE, FLA.—Bids will be received by the City Commission until Feb. 7 for the following new equipment for the municipal electric plant on Talleyrand Avenue; For three 1,500-hp. boilers and superheaters with soot blowers; coal and oil burners and ash-sluicing equipment; three air preheaters with forced and induced draft fans and connections; coal pulverizing and feeding equipment; one 25,000-kw. turbo-generator and exciter; changes in 12,500-kw. turbo-generator; one surface condensing equipment; admiralty metal condenser tubes; one deaerating feed water heater and storage tank; one turbine-driven centrifugal boiler feed pump, two 8-ft. traveling water screens, etc., and changes in present equipment in the plant. Scofield Engineering Company, Philadelphia, are consulting engineers.

MILTON, FLA.—The Gulf Power Company, Troy, Ala., is negotiating for the purchase of the municipal electric light and water plant. If taken over the company plans extensions and improvements to its system in this section.

STUART, FLA.—The City Commission is considering a bond issue of $310,000, for municipal improvements, of which $25,000, will be used for the installation of an ornamental lighting system in the downtown section, and $12,500, for an improved fire alarm system. Donald Egbert is city engineer.

WEWAHITCHKA, FLA.—A franchise has been granted to Kwilecki & Weeks, Bainbridge, Ga., to install a light, water and ice plant. The cost of the plant is estimated at $50,000.

CHATTANOOGA, TENN. — The City Commissioners have authorized an extension of the ornamental lighting system on West Ninth Street, from Broad Street to Five Points.

CARROLLTON, MISS.—The municipal light and power plant has been acquired by the Mississippi Power & Light Company, Jackson.

ISOLA, MISS.—The Mississippi Power & Light Company, Jackson, is planning extensions in its transmission lines to Isola and vicinity for local service.

LAUREL, MISS.—Plans for rebuilding the lumber and woodworking mill of the Eastman-Gardiner Hardwood Company, recently destroyed by fire with a loss of about $100,000, include a power plant.

MORRILLTON, ARK.—Work has started by the Arkansas Light & Power Company, Pine Bluff, on a preliminary survey for an extension of its 66,000-volt transmission line from North Little Rock to Morrillton, a distance of 50 miles. The plans include a substation. The cost is estimated at $150,000.

TYRONZA, ARK.—T. C. Goodrich is planning to rebuild his local power plant, recently damaged by fire, with a loss of about $25,000.

CHATTANOOGA, OKLA.—A franchise has been granted the Wolverton Power & Light Company, Lawton, to construct and operate an electric light plant in Chattanooga.

FREDERICK, OKLA.—Work will soon begin on the construction of a new building to house the electric equipment for the municipal electric distribution system and pumping plant. Electricity for the municipal system is purchased from the Southwestern Light & Power Company, Lawton.

CHILDRESS, TEX.—The Humble Oil & Refining Company, Houston, plans to install electric power equipment in its proposed storage and distributing plant, etc. in this section, to cost about $500,000.

HOUSTON, TEX.—The Houston Lighting & Power Company is considering plans for a new substation on Mack Street to cost about $50,000, with equipment.

LAREDO, TEX.—Plans are under way by the Texas Central Power Company, San Antonio, for extensions in the Laredo district, including the erection of transmission lines to various points up and down the Rio Grande River for the purpose of furnishing power for operating pumping plants for irrigation and other industries.

## *Pacific and Mountain States*

SEATTLE, WASH.—The City Council is considering the installation of improved lighting systems on portions of Third and Fourth Avenues; Jackson, Main, Washington and other streets.

TUMWATER, WASH.—The Tumwater Paper Mills Company plans to build a power plant at its proposed local mill. The entire project will cost about $600,000. L. A. DeGuere, Wisconsin Rapids, Wis., is engineer.

MEDFORD, ORE.—Work has started by the California-Oregon Power Company, San Francisco, on a new hydro-electric development on the North fork of the Rogue River. The plant will have an initial capacity of 22,000 hp. and an ultimate capacity of 66,000 hp. A diversion dam will be built about 2 miles above the power house. An open canal 6,600 ft. long, and a 3,100-ft. wood stave pipe and penstock 980 ft. long will carry the water from the forebay to the power house. A step-up substation will be built at the power house and a high-tension line 36 miles long will be erected to connect with the company's system at Medford.

GOSHEN, CAL.—The Valley Portland Cement Company, plans to install electric power equipment in its proposed local mill. The cost of the entire project is estimated at $500,000.

LOS ANGELES, CAL.—The installation of ornamental lamps on Garden Avenue, Santee Street, etc., to cost about $25,000, is under consideration.

LOS ANGELES, CAL.—Plans have been filed by the Los Angeles Gas & Electric Corporation for the erection of a substation at 1638 Palo Alto Avenue, to cost about $50,000.

MONTEREY PARK, CAL.—The City Council has authorized the installation of ornamental lamps on portions of Hathaway, Wilson, Huntington, Lincoln, Pherrin, Chandler, Moore and Garfield Avenues.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company contemplates increasing its steam power generating capacity during 1927.

SAN FRANCISCO, CAL.—Application has been made to the State Division of Water Rights by John Andrews, San Francisco, for permission to appropriate 10,000-acre feet of water per year from Storm Creek in Lessen County, and to build a dam 80 ft. high and 110 ft. long, to cost about $150,000, for irrigation and electric power purposes.

AMERICAN FALLS, IDAHO.—Plans have been submitted to the Bureau of Reclamation for approval by the Neeley Irrigation District, for a water power development in connection with a proposed irrigation system in this section. The project will cost about $280,000. W. L. Whitmore, Provo, Utah, is interested in the project.

EPHRAIM, UTAH.—Extensions to the municipal electric plant is under consideration by the Town Council.

CEDAR CITY, UTAH.—Permission has been granted the Dixie River Power Company to build another hydro-electric plant on the Santa River, below the present No. 2 station. The plans provide for a development of 800 kva., to cost about $175,000.

PHOENIX, ARIZ.—The Central Arizona Light & Power Company contemplates extensions in its transmission lines in the Salt River Valley section.

ALBUQUERQUE, N. M.—The City Council is considering the installation of an ornamental lighting system on East Central Avenue. R. L. Cooper is city engineer.

## *Canada*

CHELSEA, QUE.—The Gatineau Power Company has applied to the Public Service Commission for permission to erect a transmission line from Chelsea to the township of Hull West.

WALTON, N. S.—Arrangements have been made between the Avon River Power Company, Windsor, and the Atlantic Gypsum Products Company, Walton, for the extension of the 22,000-volt transmission line from Windsor to Walton.

# Electrical Patents

Announced by U. S. Patent Office

(Issued Dec. 21, 1926)

1,611,223. APPARATUS FOR CONTROLLING THE FREQUENCY OF AN ALTERNATING CURRENT; H. Nyquist, Jackson Heights, N. Y. App. filed Dec. 19, 1923. To provide means to hold an alternating-current generator at a speed determined by an independent variable current of constant frequency. To utilize a Wheatstone bridge in speed-regulating apparatus for an alternating-current generator.

1,611,269. ANIMATED-SHOW-CARD MECHANISM; J. H. Geraghty, Chicago, Ill. App. filed Dec. 12, 1924. An electrical motive device to operate animated show cards.

1,611,325. COMBINATION METAL BASE, ELECTRIC CONDUIT AND CONTINUOUS OUTLET BOX; A. H. Tashjian, Cleveland, Ohio. App. filed March 24, 1922.

1,611,377. ELECTRICAL CONTROL SYSTEM; A. S. Riggs, Woodcliff-on-the-Hudson, N. Y. App. filed June 14, 1921. Whereby an electric circuit, when either inadvertently or unintentionally opened, immediately is short-circuited automatically and maintained in closed condition until the circuit is restored to a normal state. Adapted particularly for use with the secondary circuit of a series transformer connected to a meter or other electro-responsive device.

1,611,405. AUTOMATIC SWITCH; E. A. Beebe, Downey, Idaho. App. filed Aug. 1, 1921. Applies to storage-battery charging system and particularly to system which prevents complete discharge of the batteries before the recharging commences.

1,611,460. ELECTRIC SWITCH; J. F. Klish, Rochester, N. Y. App. filed Oct. 11, 1921. Adapted for controlling a plurality of circuits, such, for example, as the lighting or other circuits of a motor vehicle.

1,611,464. INSULATOR SUPPORTING FIXTURE; C. J. Lemont, South Milwaukee, Wis. App. filed May 7, 1924. Secondary rack.

1,611,480. INDICATOR; C. F. Meroni, Chicago, Ill. App. filed Sept. 8, 1925. Electrical indicator or gage for indicating the amount of liquid in a tank.

1,611,499. ELECTRICAL INSTALLATION ASSEMBLAGE AND CONDUCTOR CLAMP; H. F. Vaughn and R. R. Terpening, Schenectady, N. Y. App. filed May 6, 1926.

1,611,519. BATTERY BOX OR CONTAINER; C. B. Franklin, Springfield, Mass. App. filed Nov. 12, 1924.

1,611,532. BATTERY; A. Kastelic, Richmond, Cal. App. filed June 15, 1925. Storage battery.

1,611,551, 1,611,552. LOCKING LAMP BULBS IN SOCKETS; R. E. Naumburg, Winchester, Mass. Apps. filed June 9, 1923, and Nov. 28, 1924.

1,611,568. CLOCK; M. A. Standow, Newark, N. J. App. filed June 30, 1925. Periodically wound by the energizing of a magnet arranged in an electrical circuit, which circuit carries but a light current so that the device can be used in automobiles and in similar installations.

1,611,583. ELECTRICALLY DRIVEN INDICATING INSTRUMENT; P. H. English, New Haven, Conn. App. filed Aug. 25, 1926. An indicating instrument characterized by a turbine driven at a uniform rate of speed by the discharge into it of an excess of mercury or other liquid for the purpose by an electrically driven bucket wheel provided with buckets on the general principle of an overshot waterwheel.

1,611,593. ELECTRICAL IMPULSE-GENERATING APPARATUS; P. Kapitza, Chesterton, England. App. filed April 12, 1926. For generating impulses of very large electric power for very short intervals of time, such as may be required for signaling purposes or for the creation of intense magnetic fields; comprising the combination of an alternating-current generator and a switch.

1,611,594. MERCURY SWITCH; R. L. Knutsson, Rockford, Ill. App. filed Oct. 16, 1924. Having a construction to permit it to be readily connected to a suitable socket.

1,611,612. THERMOCOUPLE ELEMENT AND DEVICE SIMILARLY CONSTRUCTED; R. H. Stein, Woodhaven, N. Y. App. filed Feb. 27, 1922. A thermocouple element without those elements which corrode, allowing deterioration and final breaking down of the device.

1,611,561. UNDERSEA LIGHT; B. F. Leavitt, Brooklyn, N. Y. App. filed Dec. 10, 1925.

1,611,653. RECTIFYING APPARATUS FOR ALTERNATING CURRENT; J. E. Lilienfeld, Brooklyn, N. Y. App. filed March 27, 1926. A dry-cell rectifier for alternating current, comprising an electrode of a highly compressed and conducting powder compound of an electro-positive and an electro-negative element.

1,611,687. SYSTEM OF PROTECTION FOR ALTERNATING-CURRENT CIRCUITS; M. L. Sindeband, New York, N. Y. App. filed July 18, 1919. Means to interrupt the circuit during short-circuit conditions, to introduce, gradually and automatically, impedance into the abnormal circuit, thereby reducing the current therein to a value where the circuit-interrupting means may safely be allowed to function.

1,611,716. MEASURING ELECTRICAL QUANTITIES; J. T. Brown, New York, N. Y. App. filed July 9, 1921. Measuring peak voltages.

1,611,721. CABLE HOOK; M. Cox, Stollings, W. Va. App. filed March 24, 1925. primarily for use in connection with mine-car motors or mining machines with which it is customary to employ a reel of the fuse type.

1,611,727. CURRENT CONTROLLER; G. S. Dey, Mount Vernon, N. Y. App. filed Aug. 21, 1924. For the control of current to various ophthalmological instruments mounted on or connected in a common standard or unit deriving current from a common source.

1,611,733. TROLLEY SHOE; W. F. Freeman, Springfield, Mass. App. filed Nov. 3, 1925.

1,611,741. REVERSE-CURRENT RELAY; W. M. Haliburton, Montreal, Quebec, Canada. App. filed Aug. 24, 1920.

1,611,749. ELECTRIC ALARM; H. Himmelman, Boonton, N. J. App. filed April 17, 1924.

1,611,769. PORCELAIN-HEATING-UNIT BRACKET; A. J. Mottlau, Jenkintown, Pa. App. filed Jan. 16, 1923. For electric heaters or toasters.

1,611,779. CIRCUIT-INTERRUPTER MECHANISM; E. K. Read, East Pittsburgh, Pa. App. filed June 4, 1923. A plurality of circuit interrupters with a common actuating member, each of the circuit interrupters being provided with a mechanism for selectively engaging or disengaging such common member.

1,611,806. PLUG CAP; L. Barnett, New York, N. Y. App. filed March 26, 1925.

1,611,823. ANNUNCIATOR; V. Durbin, Newton, Mass. App. filed Jan. 5, 1922.

1,611,826. ELECTRICAL IGNITION DEVICE; F. Fischer-Hinnen, Oerlikon, Zurich, Switzerland. App. filed March 25, 1920.

1,611,838. LOCK STRUCTURE; R. H. Malicki, Chicago, Ill. App. filed April 18, 1925. Adapted for use in retaining bolt-actuating tumblers against movement. The provision of a lock device for bolt-actuating tumblers which may be electrically operated for releasing the tumblers and automatically returned to a locking position upon actuation of the bolt.

1,611,853. METHOD AND APPARATUS FOR COUNTERING SCALING AND CORROSION; H. J. Creighton, Swarthmore, Pa. App. filed Oct. 4, 1924. Method and apparatus for preventing or eliminating the scaling or incrusting and the electrolytic corrosion of metal in contact with fluid such as containers or conduits wherein fluid is being processed. A method whereby containers or conduits, such as boilers, evaporators, economizers, condensers, cold and hot water pipes and apparatus and the like, are protected against the formation of scale from sediment or precipitates in the fluid therein contained and being processed against electrolytic corrosion.

(Issued Dec. 28, 1926)

1,611,871. HIGH-TENSION INSTALLATION; A. O. Austin, Barberton, Ohio. App. filed Oct. 20, 1911. Mechanism which shall reduce the tendency to discharge the various characters from highly charged conductors through the control of the electrostatic flux in the medium surrounding such conductors.

1,611,881. EMERGENCY HEATER; W. A. Brown, Philadelphia, Pa. App. filed July 23, 1925.

1,611,908. STORAGE BATTERY; W. S. Harley and G. C. Appel, Milwaukee, Wis. App. filed June 29, 1923. Built to withstand excessive vibration.

1,611,910. METHOD OF MAKING AND SHIPPING STORAGE-BATTERY ELEMENTS; C. W. Hazelett, Cleveland, Ohio. App. filed Jan. 23, 1922.

1,611,924. TEMPERATURE-CONTROLLED SWITCH; E. N. Lightfoot, New York, N. Y. App. filed Sept. 25, 1920. Particularly applicable for protecting electric heaters.

1,612,063. POWER-DISTRIBUTION SYSTEM; E. W. Seeger, Milwaukee, Wis. App. filed Sept. 24, 1923. Applicable to automatic substations, including two rotary transformer units, one to supply a distribution circuit under light-load conditions and the other to operate in parallel with the former under heavier-load conditions.

1,612,064. CONTACT FOR ELECTRICAL DEVICES; H. A. Sedgwick, Milwaukee, Wis. App. filed Oct. 25, 1919. Renewable contact which may be advantageously employed for rheostats and various other devices.

1,612,065. ELECTRIC RANGE; L. W. Serrell, New York, N. Y. App. filed May 16, 1925. So constructed that it may be employed for the usual and ordinary cooking operations and may also be employed as a fireless cooker.

1,612,070. THERMOSTATIC PLURAL-LAMP PULL SOCKET; R. D. Smith, Scarsdale, N. Y. App. filed Nov. 8, 1920.

1,612,076. HIGH-FREQUENCY CURRENT-MEASURING APPARATUS; L. A. Taylor, Schenectady, N. Y. App. filed March 23, 1925. A thermocouple measuring circuit for such apparatus.

1,612,084. ALTERNATING-CURRENT ARC WELDING; J. M. Weed, Ballston Lake, N. Y. App. filed June 2, 1926. Utilizing a quick reversal of the welding current corresponding to a much higher frequency when using the frequencies ordinarily used for electric power.

1,612,114. THERMAL-RESPONSIVE CIRCUIT CONTROLLER; C. I. Hall, Fort Wayne, Ind. App. filed May 2, 1921. To be inclosed in a hermetically sealed casing with a circuit-controlling thermostat element within a portion of the casing, which is arranged to be heated by apparatus under the control of the controller.

1,612,117. SYSTEM FOR THE TRANSMISSION OF ANGULAR MOMVEMENTS; E. M. Hewlett and W. W. Willard, Schenectady, N. Y. App. filed Sept. 15, 1921.

1,612,119. SYSTEM FOR THE TRANSMISSION OF ANGULAR MOTION; E. M. Hewlett and W. W. Willard, Schenectady, N. Y. App. filed Nov. 22, 1924.

1,612,120. SYSTEM FOR THE TRANSMISSION OF ANGULAR MOTION; L. E. Hildebrand, Lynn, Mass. App. filed Dec. 15, 1921.

1,612,123. ELECTRIC SWITCH; P. P. Horni, Newark, N. J. App. filed Nov. 17, 1922. Which can be in the form of an ordinary knife switch, but which is particularly adapted for use in controllers.

1,612,146. SYSTEM AND APPARATUS FOR SIGNALING; A. Nullau, Berlin-Niederschonhausen, Germany. App. filed March 10, 1923. In which an electrically controlled machine is controllable from any one of a plurality of similar control stations located at different control points to provide a system and apparatus for signaling, whereby the signal which is given at the controller which has been operated is different from the signal which is given at the other control stations, so that the control station from which the electrical machine or device has been operated is easily recognizable.

1,612,220. ELECTRICALLY HEATED BRANDING IRON; J. Ravella, Lyons, France. App. filed Nov. 28, 1925.

1,612,246. THERMAL CUT-OUT DEVICE; G. H. Whittingham, Baltimore, Md. App. filed Aug. 3, 1920. Adapted particularly for causing an interruption of the armature circuit of an electric motor upon the occurrence of prolonged overload.

1,612,254. RENEWABLE ELECTRIC FUSE; J. C. Bogle, Chicago, Ill. App. filed Dec. 1, 1922.

1,612,270. DOMESTIC-BOILER SYSTEM; A. M. Duffie, Buffalo, N. Y. App. filed June 5, 1923. Automatic storage type.

1,612,298. FLOOR LAMP; J. A. McNelly and C. E. Jones, Desloge, Mo. App. filed Feb. 26, 1926.

1,612,300. LIGHTING UNIT; K. M. Manookin, Los Angeles, Cal. App. filed July 18, 1923. For indirect lighting.

1,612,307. ARC-WELDING REACTOR; G. W. Nigg, Covina, Cal. App. filed Nov. 9, 1922. By which an ordinary alternating electric current source of supply may be directly utilized for welding purposes, without the use of rotating machines.

1,612,311. FUSE PLUG; M. H. Patrick, Schenectady, N. Y. App. filed Nov. 17, 1924. Renewable.

1,612,317. METHOD OF AND APPARATUS FOR WELDING; C. S. Reed, Yonkers, N. Y. App. filed July 23, 1925. Method particularly adapted for use in welding the fins of radiant boiler tubes.

1,612,318. CONTROL APPARATUS; L. G. Riley, Swissvale, Pa. App. filed Feb. 20, 1923. A contact terminal comprising a plurality of layers of a spirally wound continuous ribbon of conducting material and having spacing material between each of the layers.